

**Unconventional Resources Technology Advisory Committee  
September 11-12, 2008  
Sixth Meeting**

**Meeting Minutes**

## Unconventional Resources Technology Advisory Committee

I hereby certify that this transcript constitutes an accurate record of the Sixth Unconventional Resources Technology Advisory Committee Meeting held on September 11-12, 2008 at the Alexandria Hilton in Alexandria, Virginia.

 FOR  
Chris Hall, Chair  
Unconventional Resources Technology  
Advisory Committee

7-6-2009  
Date

A Federal Advisory Committee to the U.S. Secretary of Energy

**Unconventional Resources Technology Advisory Committee (URTAC)  
Sixth Meeting  
September 11–12, 2008  
Alexandria Hilton, Alexandria, Virginia**

## **Welcome**

The Designated Federal Officer (DFO), Mr. Guido DeHoratiis, convened the Sixth Meeting at 8:00 a.m. He opened by welcoming the 2008–2010 Unconventional Resources Technology Advisory Committee (the Committee) members, acknowledging the returning members, and offering a special welcome to the new members. Attachment 1 lists all members of the 2008–2010 Committee.

Mr. DeHoratiis introduced the Chair, Chris Hall and the Vice Chair, Jeff Hall. Mr. DeHoratiis then reviewed the safety guidelines for the meeting. For the record, Attachment 2 contains the appointment documents for Messrs. C. Hall and J. Hall, signed by Assistant Secretary for Fossil Energy, James Slutz, and Attachment 3 contains the approved meeting agenda.

The Committee Manager, Ms. Elena Melchert, verified that a quorum was present<sup>1</sup>.

## **Introductions**

Chris Hall invited the Committee members to introduce themselves in case some of the new members had not yet had the opportunity to meet everyone personally.

## **Ethics Training**

At 8:30 a.m., Ms. Christina Hymer, Department of Energy (DOE) Office of General Counsel, conducted the ethics training required annually for special Government employees (SGE). She highlighted the role of the SGEs and the circumstances under which they are obligated to recuse themselves from Committee discussions. She noted that SGEs are appointed by the Secretary for their expert opinion while representative members represent the point of view of particular groups. Ms. Hymer's handouts are included as Attachment 4, and Attachment 5 lists the point of view each member was appointed to represent.

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<sup>1</sup> A quorum requires that ½ of the full time committee members plus one must be present for a quorum. As there are 18 full time members on the Committee, this requires 10 (9+1) to be present for a quorum, and 11 were actually present.

## **Committee Instructions**

At 8:50 a.m., Mr. DeHoratiis discussed the role of the Committee, stressing the advisory function for the Secretary of Energy. His presentation materials are included in Attachment 4. In addition to the Committee instructions, Mr. DeHoratiis also reviewed the meeting objectives and strategic questions to guide the Committee over the next day and a half as they proceed through their deliberations. At 9:00 a.m., Mr. DeHoratiis asked that the Committee observe a moment of silence in remembrance of September 11, 2001.

## **Committee Orientation**

At 9:05 a.m., Ms. Elena Melchert, the Committee Manager, provided an orientation for the group focusing on the evolution of the activity under Subtitle J since the Energy Policy Act of 2005 became law in August of 2005. Attachment 5 has copies of her presentation materials.

## **Presentations**

### Overview of DOE Oil and Gas Program

At 9:10 a.m., Mr. DeHoratiis provided an overview of the Subtitle J program and how it relates to the overall DOE Oil and Gas R&D Program. His presentation slides are shown in Attachment 6.

At 9:25 a.m., the Committee took a break and reconvened at 9:50 a.m.

### DOE Oil and Natural Gas Research, Development, and Demonstration (RD&D) Program

Mr. John Duda, Director, National Energy Technology Laboratory (NETL) Strategic Center for Natural Gas and Oil, presented an overview of the Oil and Gas Research Program as detailed in Attachment 7. The purpose was to provide some background for the new members of the Committee on the role of the DOE in support of the oil and gas industry. He also highlighted the funding of the program to show how the Energy Policy Act of 2005 (EPAc 2005) Subtitle J, Unconventional Resources Program and the Small Producers Program relate to the traditional DOE oil and gas research programs.

His presentation highlighted the organizational structure of NETL, its facilities, employees, and responsibilities. He also indicated that NETL is heavily involved in many new initiatives including methane hydrates, conventional oils from unconventional formations (e.g., Bakken Shale), heavy oil, circum-Arctic resources, and enhanced oil recovery.

Mr. Duda then provided background on the EPAc 2005 Subtitle J program and the roles of the Program Consortium, Research Partnership to Secure Energy for America (RPSEA) and NETL. NETL has two key roles: 1) to manage the RPSEA contract and, 2)

to conduct complementary research. He explained the importance of the Annual Plan and how approval and release of the plan to Congress is required prior to the release of funds.

The Committee's role in the development of the Annual Plan was also discussed, noting the requirement of written recommendations from the Committee. Next, he reviewed the key milestone dates associated with the *2008 Annual Plan* in terms of transmittal to Congress, availability of funds, and schedule for release of solicitations. The *2008 Annual Plan* had been transmitted to Congress and that the Fiscal Year 2008 funds had been made available during August 2008.

Mr. Duda discussed that the Technical Committee<sup>2</sup> had been organized by NETL to review the NETL Complementary Research Program. He noted that the Complementary Research Program was judged to be non-duplicative and that the Technical Committee determined that sufficient communication channels are in place to ensure this continues. The Technical Committee's report is appended to these minutes as Attachment 12.

Also discussed was that the Government Accountability Office (GAO) will be reviewing an independent audit<sup>3</sup> of the Program Consortium, and that results are expected in 6–8 weeks. The Secretary of Energy is required to transmit the final audit to Congress. The Committee requested a copy of the final audit when it becomes available.

Mr. Duda then discussed the highlights of the collaborative process between NETL and RPSEA involved in executing various requirements of the Subtitle J program. Highlights included: the development of a streamlined subcontract approval process, the active role that NETL was undertaking in coordinating the analysis<sup>4</sup> of program benefits, the overall responsibility assumed by NETL in coordinating the technology transfer program<sup>5</sup>, and finally, the role of NETL in approving RPSEA research subcontracts. Mr. Duda concluded his presentation with a review of the improvements to the subcontract award cycle times for the 2007 program that resulted from enhanced coordination between RPSEA and NETL.

### 2009 Annual Plan Overview

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<sup>2</sup> Energy Policy Act of 2005, Title IX, Subtitle J, Section 999H(d) (4) *the establishment and operation of a technical committee to ensure that in-house research activities funded under section 999A(b)(4) are technically complementary to, and not duplicative of, research conducted under paragraphs (1), (2), and (3) of section 999A(b).*

<sup>3</sup> Energy Policy Act of 2005, Title IX, Subtitle J, Section 999B(h) *Audit- The Secretary shall retain an independent auditor, which shall include a review by the GAO, to determine the extent to which funds provided to the program consortium, and funds provided under awards made under subsection (f), have been expended in a manner consistent with the purposes and requirements of this subtitle. The auditor shall transmit a report (including any review by the GAO) annually to the Secretary, who shall transmit the report to Congress, along with a plan to remedy any deficiencies cited in the report.*

<sup>4</sup> Energy Policy Act of 2005, Title IX, Subtitle J, Section 999B(e)(5) *ESTIMATES OF INCREASED ROYALTY RECEIPTS- The Secretary, in consultation with the Secretary of the Interior, shall provide an annual report to Congress ... on the estimated cumulative increase in Federal royalty receipts (if any) resulting from the implementation of this subtitle.*

<sup>5</sup> See Attachment 8 for the NETL Technology Transfer overview

The Chair introduced Mr. Mike Ming, President, RPSEA, who presented an update of key information regarding the Program Consortium (Attachment 9). RPSEA currently has 140 members featuring a broad diversity of membership, including research universities, large and small oil producers, national labs, financial entities, venture capital firms, trade associations, consumer associations, and representatives of regulatory groups. RPSEA recently added 14 new members and that 8 prospective members were pending approval by the Secretary of Energy. A key RPSEA objective is to achieve a broad outreach to ensure success of the program and Mr. Ming indicated that this element of the program is proceeding very well.

Mr. Ming indicated that the organization is made up of the equivalent of 16 full time management and staff, including 4 full time RPSEA employees supported by four major subcontractors from established entities. SAIC has four to five representatives on the staff providing administrative and contracting support. Chevron is contracted through the Deepstar organization, which is a private research organization managed by Chevron; it has 8 operating companies and 50–60 contributing members including companies like Chevron, BP, Anadarko, Marathon, and Shell, among others. The Gas Technology Institute, which has a long history in unconventional gas resources technology, manages the Unconventional Resources part of the program, including oversight over the Small Producer segment in conjunction with New Mexico Institute of Mining and Technology.

Overview of the 2009 Draft Annual Plan:  
Unconventional Resources and Small Producers Program

At 1:30 p.m., Mr. Bob Siegfried of RPSEA presented an overview of the Unconventional Resources and Small Producer Programs. His presentation slides are shown in Attachment 10.

Mr. Siegfried presented the background information on the development of the 2009 Draft Annual Plan<sup>6</sup>. He discussed that the *2009 Annual Plan* is essentially a continuation of the strategy established in the 2007 and 2008 plans, taking into account input from URTAC. He also noted that a number of forums, technical conferences, and topical meetings have been conducted to solicit input from industry, academia, and other interested parties.

Mr. Siegfried presented a chart that highlighted the geographic diversity of the unconventional resources program, which stretches from the west coast to the east coast. Of the total 26 project selections from the 2007 program, 19 are in the conventional resources program and remaining 7 are in the small producer program. Specific targeted

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<sup>6</sup> The *Draft 2009 Annual Plan* was posted to various DOE websites during August 2008 and is available at: [http://www.fossil.energy.gov/programs/oilgas/ultra\\_and\\_unconventional/2009\\_Annual\\_Plan/2009\\_Annual\\_Plan\\_Section\\_999\\_DOE\\_August\\_.pdf](http://www.fossil.energy.gov/programs/oilgas/ultra_and_unconventional/2009_Annual_Plan/2009_Annual_Plan_Section_999_DOE_August_.pdf)

resources include the New Albany shale in the Illinois Basin, Rocky Mountain tight sands, and potential shale resources in Alabama and Utah.

Next, Mr. Siegfried discussed some statistics regarding the project selection and the prime research entities. The vast majority of the project selections were made to consortia groups led by universities for both the unconventional and small producer segments, which included participation from industry and other sectors.

Regarding the recently released *2008 Annual Plan*, Mr. Siegfried informed the Committee that technology transfer had taken a higher priority in response to the Committee's feedback in prior sessions. Additionally, the environmental initiatives took a more prominent role in the solicitations, again reflecting advice from the Committee. He reported that the solicitations were designed to fill in the portfolio gaps from a technology point of view targeting the Appalachian region, water management, and emphasis on the drilling footprint in tight sands applications.

Turning to the *2009 Annual Plan*, he indicated that flexibility has been built into the plan to allow RPSEA to adapt the solicitations and project awards toward a more integrated overall program. It was also recognized that several areas are in need of additional emphasis, including the Appalachian region, thereby decreasing the environmental footprint, water management, and complex multi-zone completions. Accordingly, a menu format has been developed featuring a field-based approach to allow flexibility in the selection process to assure that the broad integrated objectives are being met.

Next, Mr. Siegfried presented the highlights of the Small Producer Program. Focus includes improving water management and optimization of water use coupled with improving oil and gas recovery from mature fields and reducing operating costs. Longer term, the objective is to adapt these new technologies to new geological basins.

From the 2007 program, several projects have been approved dealing with water treatment, enhanced oil recovery, environmental impact, and improving recovery and sweep efficiency. Each of the projects involves a consortium of researchers and small producers, with the latter coordinated by the Research Advisory Group (RAG).

The *2008 Annual Plan* involved only slight revisions to the *2007 Annual Plan*, including emphasis in technology transfer and maintaining advanced technologies for mature fields.

The *2009 Annual Plan* solicitations focus on advancing technology for mature fields while completing the 2007 and 2008 project selections. The specific technology challenges include carryover items from 2007 and 2008 plus improved methods for completions and recompletions, field test of emerging technologies, well and field data management, and capture and reuse of waste products to reduce costs or increase recovery.

Next, Mr. Siegfried presented an overview of the technology transfer program which features a phased approach whereby 1.5% of the allotted funds are to be spent by the

research provider in developing the necessary outreach communications package and the balance 1% to be spent in coordinating the overall program (e.g., setting up workshops, conferences, and websites).

## **Committee Discussion**

On the subject of technology transfer, a number of questions were raised. In response to a question about the magnitude of the fund allocation, the overall percentage could be raised to higher levels for specific projects, if warranted. This might be the case on some small producer projects, as the outreach effort required to implement new technologies can be much higher than with the unconventional resources program.

On the subject of water management, the Committee pressed for more specifics. Some Committee members felt that it was very important to get some communication out to the small producers on progress to attract attention to the program. They suggested that consideration be given for a standalone technology transfer activity even if results from new technology development were not yet ready for dissemination. During the detailed discussions, the Committee Manager reminded the Committee that it was not appropriate for the group to discuss specific projects in detail<sup>7</sup>. After exploring the point further, it was noted that Dr. Cline had a potential conflict of interest with one of the projects and he was asked to recuse himself from those specific discussions.

It was suggested that more attention should be paid to the regional impacts of the R&D program. Specifically, it was felt that California does not appear to be receiving much direct benefit from the programs and that the central and southern U.S. regions were receiving the bulk of the attention. As an alternative, it was suggested that the maps that show the participation of researchers could be adapted to show the technology beneficiaries of as one way of demonstrating a wider reach of the R&D programs. Also, aside from the RPSEA program regional impacts, the Committee should also consider the impacts of the Complementary Program directed by NETL.

A Committee member suggested that one of the main reasons that small producers are not pursuing the latest technologies in their operations was related to the high costs of the newer technologies. Thus, it was suggested that the economic issues should be raised in the feedback letter to the Secretary of Energy, possibly with a recommendation leading to some form of tax incentive to pursue new technologies and help mitigate the significant financial risks.

It was reported that one project had been awarded that involved immiscible CO<sub>2</sub> sequestration. That encouraged the Committee because the Subtitle J legislation specifically mentioned interest in carbon sequestration technologies as an objective of the program, and therefore, it was a positive sign that the program was being responsive.

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<sup>7</sup> Energy Policy Act of 2005, Title IX, Subtitle J, Section 999D(c) *Prohibition- No advisory committee established under this section shall make recommendations on funding awards to particular consortia or other entities, or for specific projects.*



Further work in this area was encouraged, considering the continued growing interest in controlling greenhouse gas (GHG) emissions.

Mr. Siegfried led the discussion of outstanding items from his presentation. In response to a question regarding the progress on individual R&D projects, Mr. Siegfried responded that the contracts for research had only recently been awarded (2Q2008) and therefore it is too early to have definitive results.

Also, one Committee member highlighted the need to measure program benefits. She noted that in response to Congress' desire to develop comprehensive techniques for measuring research accomplishments, one DOE program addressed this in a positive manner. Specifically, during reviews of Energy Efficiency and Renewable Energy (EERE) research programs, input was solicited from the National Academy of Sciences and the National Research Council. They reported on a range of "metrics for success" that were recommended for tracking progress, including cost savings, environmental improvements, and energy savings.

The subsequent progress report issued by EERE had been well received by both Congress and the OMB. Therefore, it was recommended that RPSEA get a copy of their joint report and consider using their model in future benefits assessments. Mr. Siegfried responded that he was appreciative of that feedback from the Committee. He also reinforced the point that the objective of the program was not to develop programs of the benefit of industry, but rather the program sought to generate public benefits by developing successful R&D programs that in turn would attract industry investments and generate public benefit.

The Committee Manager also reported that the OMB had requested the comprehensive benefits analysis program be developed to allow measuring program progress. In response, the DOE issued a letter dated April 9 of this year (which is included in the member packet and shown in Attachment 11 that communicates the plan for developing the benefits analysis as an integral part of the 2010 Annual Plan). Mr. Duda also commented that he would be elaborating further on this subject in his presentation the following morning.

On the subject of produced water, a question was raised regarding whether any actual R&D programs are underway to develop technologies to treat water with 100,000 ppm chlorides, which is typical of the issues facing small oil and gas producers today. In response, a number of programs were reported as being underway. Additionally, the DOE traditional oil and gas program was developing a strategic program to initially catalog all of the existing technologies and their applications and also to conduct a thorough needs analysis.

The Chair suggested that the NETL knowledge management database (which was motivated in large part due to the recommendations of the Advisory Committee last year) should be a candidate to warehouse all of the produced water results.

## **Subcommittee Structure**

At 3:40 p.m., the Committee started discussions on how best to organize subcommittees to address the key theme areas as an efficient mechanism for developing the Committee's recommendations. This effort resulted in a grouping of themes and the related specific issues as detailed below:

### **Research Focus**

- Environment
- Produced and waste water
- Lack of geophysics focus
- Oil shales research
- Enhanced oil recovery (EOR)
- Evaluate selected projects
- Technology to extract maximum information from existing data (in context of mature fields)
- Identify resources
- Environmental fate and impact of coal production wastes
- GHG reduction and carbon sequestration
- EOR-sequestration-power generation integration
- Stimulating horizontal shale wells
- Real-time data analysis
- Completions/stimulation
- Enhanced coal bed methane (CBM) + carbon sequestration focus
- Enhanced CBM production via biogenesis

### **Technology Transfer**

- Technology transfer to small producers
- Technology "supply chain" improvement
- Capture and transfer technology from basin to basin
- Make sure technology transfer hits the right targets
- Create connection between unconventional and small producers
- Focus on some quick results

### **Environment**

- Regulatory best practices
- Air impacts from exploration and production (E&P)
- Environmental impact mitigation

### **Process**

- Early wins
- Integrate technologies from other industries

### **Executive Summary (Policy)**

- Tax incentives
- Federal input into state regulatory development process

Regulatory impediments to efficiency in oil and gas operations  
Multi-department study recommendations  
No-go areas overlaid with resources  
Address technology-to-market barriers/issues

The Committee then invited members to participate in teams with the following subcommittee assignments:

### **Subcommittee Members**

#### **Research Focus**

Ray Levey\*, Jeff Cline\*\*(backup), Shahab Mohaghegh, Bob Hardage, Nancy Brown, Nick Tew, Scott Anderson, Don Sparks, James Dwyer, Fred Julander

#### **Technology Transfer**

James Dwyer\*, Chris Hall, Janet Weiss, Bob Hardage, Bill Daugherty, Jeff Cline

#### **Environment**

Jeff Cline\*, Janet Weiss\*(backup), Scott Anderson, Julie Falkner, Nancy Brown

#### **Process**

Jessica Cavens\*, James Dwyer, Sally Zinke, Jeff Hall, Fred Julander

#### **Executive Summary (Policy)**

Chris Hall\*, Scott Anderson, Sandra Mark, Nick Tew, Julie Falkner, Jessica Cavens, Fred Julander

#### **Editing Sub-Committee**

Chris Hall\*, Sally Zinke, Jim Dwyer

\* *Chairman*

Also, the Committee established a schedule for activities through to October 23 when the Committee is schedule to meet via teleconference to approve the final document to be released to the Secretary of Energy. The schedule milestones are as follows:

#### **Schedule**

Today	Discuss sub-group procedures
9/15–9/19	Collect comments to themes (e-mail) Sub-Group Chair collates and distributes
9/22–10/3	Hold sub-groups conference call: review Sub-group Chair drafts final input: submit to sub-group, Chair, DOE
10/6–10/10	DOE collects/assembles all themes and distributes to full committee
10/16	Houston meeting
10/17	Editing group conference
10/23	Final phone conference to approve report

The Committee adjourned at 5:15 p.m.

## **September 12, 2008**

The Committee meeting convened at 8:05 a.m. The Chair outlined the plan for the morning, including the discussion of the NETL Complementary Program and finalization of the subcommittee plans, including detailing the theme issues and schedule.

### **NETL Systems Analysis and Planning Activity Overview**

At 8:10 a.m., Mr. Duda opened his session by suggesting that Committee members are encouraged to view the DVD entitled "Independent Oil: Rediscovering America's Forgotten Wells." The DVD was produced by the Stripper Well Consortium and can be ordered for free from the following URL:

<http://www.energy.psu.edu/swc/communications.html>. It is an example of a useful technology transfer device.

Mr. Duda then presented an overview of the Systems Analysis and Planning activity to be followed by David Wildman discussing the details of NETL's Complementary Program. His presentation materials are included in Attachment 12.

Regarding the information presented, the Chair asked whether the benefits analysis program was capable of simulating the effects of changes in financial factors like tax breaks or canceling of tax provision currently allowing expensing of certain exploration and production costs. Mr. Duda responded that although they have not evaluated that alternative to date, perhaps they could. It would be a follow-up item for the future.

### **NETL Complementary Program**

At 8:40 a.m., Mr. Duda introduced David Wildman, who had prepared a detailed overview of the Complementary Program. Mr. Wildman's discussion focused on the key areas in the NETL's Complementary program, including drilling under extreme conditions, environmental impacts of oil and gas, enhanced and unconventional oil recovery, and resource assessment. His presentation is provided in Attachment 13.

The Committee took a break at 9:15 a.m. and reconvened at 9:35 a.m.

### **Subcommittee Support Activities**

Ms. Nateena Dobson presented the coordination procedures for the subcommittee activities. She advised that DOE was prepared to assist the subcommittee chairs in arranging for teleconferences and handling subcommittee communications, facilitating interactions with RPSEA, and helping the subcommittees abide by the terms of reference established for the work of the subcommittee. Her slides are shown in Attachment 14.

Ms. Dobson concluded at 9:50 a.m.

Discussion: Subcommittee Structure

The Committee broke into the subcommittees to develop their plan for developing recommendation on the *2009 Annual Plan*. The Committee reconvened at 10:45 a.m. to discuss the conclusions from the subcommittee members. The Chair suggested that the results from each subcommittee be presented in the final order that they will appear in the final letter to the Secretary of Energy, namely: Executive Summary, Process, Research Focus, Technology Transfer, and Environmental. The Chair also encouraged the subcommittees not only to highlight the issues or weak areas in the plan but also to compliment those areas that seem to be working well. The presentations are provided in Attachment 15.

After the presentation of the *2009 Annual Plan* Executive Summary, there was further discussion on the “no-go” areas. This is a complicated issue and it was agreed that discussion of no-go areas had to be tempered with a resource assessment. A Federal Government inter-departmental effort was seen as the best mechanism to pursue that subject. A tentative agreement was reached whereby this no-go topic would be covered in both the executive summary and the environmental area, but the Chair reserved the right to retable this point.

On the regulatory issues item, it was clarified that the intention was to focus on items that are under regulatory control but which could evolve into a more general standardized policy that might help the overall thrust of the oil and gas effort. For example, perhaps well spacing standards should be considered on a broader, national scale, perhaps under the guidance the Interstate Oil and Gas Commerce Commission (IOGCC). Best practices are another area that could fall under the regulatory issues topic.

On the Process Subcommittee, it was suggested that the Federal Laboratory Commission be added to the reference to other industries, as they are an important element in ongoing research. Also, it was felt that it is important to note the role of technology transfer in disseminating the early wins to ensure that industry is aware of those developments promptly.

The Research Focus Subcommittee combined the 16 topics into 6 higher level core activities, namely: environmental, enhanced coal bed methane and CO<sub>2</sub>, oil shale and enhanced oil recovery, data analysis and uncertainty, geophysics, and stimulation.

In the discussion it was agreed that air quality and oil shale environmental issues would be included under the environmental topic. Also, it was understood that the oil shale item primarily referred to the water consumption issue. At that point, discussion leaned toward specific projects and Ms. Melchert reminded the Committee that its scope is limited by law to avoid discussion of specific projects to avoid the appearance of a conflict of interest.

The Technology Transfer Subcommittee identified six focus areas:

- 1) Transfer tech to small producers (it was felt that it is time to formalize a plan to address the needs of the small producers)
- 2) Link the tech transfer data to other data warehouses
- 3) Focus on quick results and managing information transfer to industry
- 4) Evaluate advanced technologies (e.g., webinar, or some other computer based systems that already exist)
- 5) Give thought to the development of some metrics to measure the performance of the tech transfer system
- 6) Re-evaluate the level of funding for the tech transfer activity and whether the Committee feels that it is appropriate or not

Discussion focused on the value of Petroleum Technology Transfer Council (PTTC). Some felt that the PTTC was very valuable to the industry and that DOE should consider a higher level of funding for that activity. The Chair was asked for an opinion on that at which point the Chair revealed that he was a board member of the PTTC. He added that he did not receive any compensation from that relationship. Subsequently, Mr. Tew also acknowledged that he is a member of the PTTC board and acts on a voluntary basis for the benefit of the state of Alabama.

The Chair suggested that, due to the high level of interest in the PTTC, at the next Committee meeting a 5-minute presentation should be developed for the benefit of the Committee so that they could better understand the functioning of the PTTC. For example, it was noted that the Society of Petroleum Engineers (SPE) technology transfer activity focused more on the technical aspects of the business whereas the PTTC focused on how best to implement the technologies into ongoing industry activity more from a business perspective. Ms. Melchert also suggested that in light of the continuing high level of interest in technology transfer, perhaps this is an area where a standing committee might be appropriate.

Regarding the Environment Subcommittee, two main challenges were raised:

- 1) Regulatory best practices – includes the fact that the Bureau of Land Management (BLM) communicates best practices for handling permit procedures, and Environmental Impact Statement (EIS) preparation. The western states governors group have established industry best practices but up to now it only applies to coal bed methane; perhaps it could be expanded. The ultimate goal is nationwide consistency in best practices.
- 2) Environmental impact analysis and mitigation – seek consistency across the nation in identifying conservation “no-go” areas overlaid with pertinent resource implications.

In the discussion it was suggested that point 2 should also present recommendations on how to address these issues and who should take the lead role. Perhaps this is an area

where the Interstate Oil and Gas Commerce Commission (IOGCC) groups, which are partially funded by the DOE, could take the lead as they are viewed as being less confrontational and perhaps more able to resolve these complicated issues.

Also in the discussion, the Committee reported that occasionally the overlapping jurisdictions of state and federal agencies (like the fish and game groups) do not agree on the best approach. These conflicts can lead to significant inefficiencies from the oil and gas industry point of view.

### **Review of Action Items by Committee Manager**

At 11:40 a.m., the Committee Manager then reviewed all of the outstanding action items. They included:

- 1) Distribute documentation to certify that the complementary program is not duplicative of the RPSEA plan as assessed by an independent technical group arranged by NETL.
- 2) The tech transfer group is to include within its scope the question of how to ensure maximum effectiveness of the tech transfer process to meet the needs of industry.
- 3) All participants in the subcommittee meetings must be recorded for general counsel review; also general counsel needs to be contacted to establish the proper procedure for dealing with committee members that have an active interest in some specific projects undertaken by RPSEA.
- 4) The Committee Manager will liaise with the Chair and the DFO to determine whether a standing subcommittee structure would benefit the activities of the Committee.
- 5) There is a need to develop a mechanism for communicating information on individual projects to the Committee recognizing that a review of the information in the Committee meetings is not practical due to time limitations.

The Chair concluded by advising the group that he intends to visit Washington, D.C on September 29 to have discussions with OMB, GAO, or other agencies or representatives on Capitol Hill regarding the program to hopefully lend support to its ongoing activities. Other members were invited to join. Participation of Committee members would be done on an individual basis with no reimbursement for the costs incurred. Ms. Melchert noted that it is not appropriate for SGEs to participate in such a meeting due to their special role.

### **Public Comment and Adjournment**

The Committee Manager reminded the Designated Federal Officer that no member of the public had reserved time to speak before the committee. Therefore, the meeting adjourned at 12:00 p.m.

## Attachments

	<b>Presenter</b>	<b>Topic</b>
1	For the Record	2008–2010 Unconventional Resources Technology Advisory Committee (URTAC) Member Roster
2	For the Record	Letter appointing the Committee Chair and Vice Char
3	For the Record	Meeting Agenda
4	Mr. Guido DeHoratiis	Committee Instructions
5	Ms. Elena Melchert	Committee Orientation
6	Mr. Guido DeHoratiis	Overview of the DOE Oil and Gas Program
7	Mr. John Duda	DOE Oil and Natural Gas Research, Development, and Demonstration Program
8		NETL Technology Transfer Overview
9	Mr. Mike Ming	RPSEA Overview
10	Mr. Bob Siegfried	Overview of the 2009 Draft Annual Plan: Unconventional Resources and Small Producer Programs
11	For the Record	Benefits Analysis Proposal Letter
12	Mr. John Duda	NETL Complementary Program: NETL Systems Analysis and Planning Activity Overview
13	Mr. Dave Wildman	NETL Complementary Program: NETL Office of Research and Development
14	Ms. Natenna Dobson	Subcommittee Support Activities
15	For the Record	Subcommittee Presentations
16	For the Record	Meeting Attendance Records



## **Attachment 1**

**Unconventional Resources Technology Advisory Committee  
2008-2010**

Mr. A. Scott Anderson Senior Policy Advisor Environmental Defense Fund Austin, TX	Ms. Juliette A. Falkner Senior Policy Advisor The Nature Conservancy Arlington, VA	Dr. Sandra D. Mark Geological Advisor Black Hills Exploration and Production Evergreen, CO
Dr. Nancy J. Brown* Senior Scientist & Department Head Lawrence Berkeley National Laboratory Berkeley, CA	Mr. Jeffrey D. Hall Manager of Exploration/Exploitation Devon Energy Corporation Oklahoma City, OK	Dr. Shahab D. Mohaghegh* Professor West Virginia University Morgantown, WV
Ms. Jessica J. Cavens Geologist EnCana Oil & Gas (USA) Denver , CO	Mr. J. Chris Hall President Drilling Production Co. Torrance, CA	Mr. Don L. Sparks Chairman of the Board Discovery Operating, Inc. Midland, TX
Dr. Jeffrey T. Cline* CEO and President Cline Energy Consulting Houston, TX	Mr. Bob Hardage* Senior Research Scientist University of Texas at Austin Austin, TX	Dr. Berry H. Tew State Geologist State Oil and Gas Board of Alabama Tuscaloosa, AL
Mr. William S. Daugherty Chairman and CEO NGAS Resources, Inc. Lexington , KY	Mr. Fred C. Julander President Julander Energy Company Englewood, CO	Ms. Janet Weiss Director, Unconventional Gas Technology BP America, Inc. Houston, TX
Mr. James P. Dwyer Drilling Applications Engineering and Geosciences Baker Hughes INTEQ Houston, TX	Dr. Raymond A. Levey* Director Energy & Geoscience Institute University of Utah Salt Lake City, UT	Ms. Sally G. Zinke Director of Exploration Ultra Petroleum Englewood, CO


\* special Government employee

## **Attachment 2**



**Department of Energy**  
Washington, DC 20585

**MEMORANDUM FOR THE RECORD**

**FROM:**   
**JAMES A. SLUTZ**  
**ASSISTANT SECRETARY (ACTING)**  
**OFFICE OF FOSSIL ENERGY**

**SUBJECT: Appointment of Committee Chair and Vice-Chair**  
**Unconventional Resources Technology Advisory Committee**

Whereas, article 12 of the committee charter states that the Secretary shall designate a chair and vice-chair, and article 1.23 of the Department of Energy Delegation Order No. 00-002.00G and article 1.5 of the Department of Energy Redelelegation Order No. 00-002.04C transfer this authority of the Secretary to the Assistant Secretary for Fossil Energy, I hereby designate Mr. J. Chris Hall and Mr. Jeffrey D. Hall to serve as the Chair and Vice-Chair, respectively, of the Unconventional Resources Technology Advisory Committee for the two year term of 2008-2010.



## **Attachment 3**

**Unconventional Resources Technology Advisory Committee**  
**September 11-12, 2008**  
**The Hilton Alexandria Old Town, Alexandria, VA**  
**Sept. 11 Meeting Room: Salon A**  
**Sept. 12 Meeting Room: Washington/Jefferson**

September 11, 2008

7AM	Member Breakfast / Open Registration SGE Oath of Office	
8:00	Call to Order/ Welcome / Introductions	Guido DeHoratiis Designated Federal Officer
8:10	FACA Overview / Ethics Briefing	Christina Hymer, DOE Office of General Counsel
9:10	Committee Instructions	Guido DeHoratiis
9:30	Committee Orientation Committee questions/discussion	Elena Melchert Committee Manager
10:00	BREAK	
10:15	DOE Oil & Gas Program Committee questions/discussion	Guido DeHoratiis, Acting Deputy Assistant Secretary for Oil and Natural Gas
10:30	DOE Oil & Gas Research & Development Program; Committee questions/discussion  Status of the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Program 2007-2008	John R. Duda, Director, Strategic Center for Natural Gas and Oil National Energy Technology Laboratory (NETL)
11:30	Committee questions/discussion	
Noon	(Working) LUNCH 1 HOUR BREAK	
1:00	Overview of the <i>2009 Draft Annual Plan: Unconventional Onshore &amp; Small Producer Programs</i>	Michael Ming Robert Siegfried Research Partnership to Secure Energy for America (RPSEA)
2:00	Committee questions/discussion	
2:30	BREAK	
2:45	Committee discussion	Chris Hall, URTAC Chair
5PM	Adjourn	Guido DeHoratiis

**Unconventional Resources Technology Advisory Committee**  
**September 11-12, 2008**  
**The Hilton Alexandria Old Town, Alexandria, VA**  
**Sept. 11 Meeting Room: Salon A**  
**Sept. 12 Meeting Room: Washington/Jefferson**

September 12, 2008

7AM Member Breakfast / Open Registration

8:00 Call to Order Chris Hall

Continue Committee Discussion/Questions  
re: *2009 Annual Plan*

9:00 Overview of NETL Complementary Research Program John R. Duda  
Dave Wildman, Office of Research and Development, NETL

9:30 Committee Discussion Chris Hall

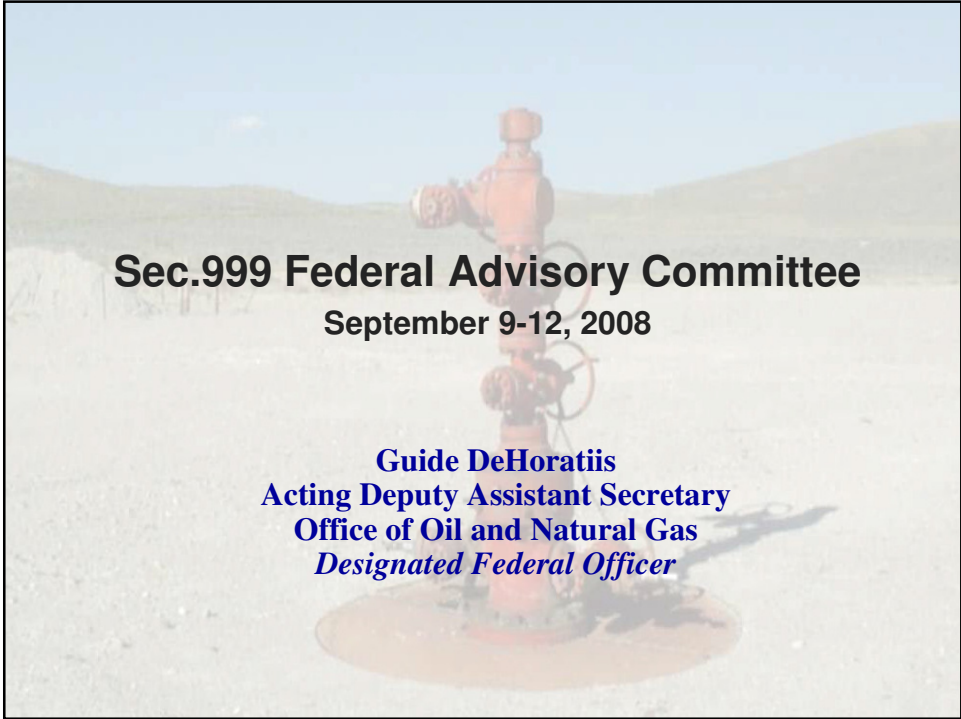
10:00 Next Steps: Subcommittees Natenna Dobson, UDAC  
Subcommittee Coordinator

11:00 Summarize open action items Elena Melchert

Noon Adjourn Chris Hall

## **Attachment 4**





## **Sec.999 Federal Advisory Committee**

**September 9-12, 2008**

**Guide DeHoratiis**  
**Acting Deputy Assistant Secretary**  
**Office of Oil and Natural Gas**  
*Designated Federal Officer*

### **Committee Instructions**

- **Role: Provide advice to DOE**
  - Provide recommendations on the development and priorities of the research program
  - Look at objectives of the annual plan within the context of the overall plan
  - Focus on Consortium-administered portion of the Plan, and also comment on NETL research and potential for duplication between NETL and Consortium portions
- **Guidance**
  - Focus on big picture. Don't rewrite plan but advise on strengths and weaknesses.
  - Consensus is good, but should not be forced.
  - Majority opinion with minority viewpoint is fine.

## Meeting Objectives

- **Finalize Committee advice by October 2008**
  - During Today's meeting
    - Speakers provide background presentations
      - Committee asks clarifying questions
    - Facilitated Committee Discussions
      - Initiate discussion on Plan
      - Develop process to complete Committee work
  - October meeting in Houston
    - Draft final recommendations
    - Appoint editing subcommittee
  - Conference call on October 23, 2008
    - Approval of final recommendations that will be presented to DOE


*Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources*

## Strategic Questions for the Committee

- **Does the plan, as a whole, represent the best approach for utilizing the R&D funds available?**
  - Does it fit well within the overall oil and gas program?
- **Are the plan's goals & objectives appropriate?**
  - Do they comply with the intent of EPACT 999?
  - Are they achievable yet challenging?
  - Do annual activities work toward longer-term goals?
- **Are the proposed R&D themes appropriate?**
  - Do number of themes fit the expected budget?
  - Do they allow flexibility given the uncertainty of response?
- **Is the solicitation process appropriate?**
  - Fair and open, competitive, transparent?

*Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources*

## **Attachment 5**



## Unconventional Resources Technology Advisory Committee

September 11-12, 2008

**Elena Melchert**  
**Office of Oil and Natural Gas**  
*Committee Manager*

### **2008 - 2010 Unconventional Resources Technology Advisory Committee Member Appointment Process**

<b>August 2005</b>	Energy Policy Act of 2005 signed into law [P.L. 109-58, 119 Stat. 922]
<b>November 2005</b>	National Energy Technology Laboratory (NETL) released solicitation for a consortium to administer 3 program elements under Section 999A
<b>February 2006</b>	Proposals received for program consortium solicitations
<b>May 2006</b>	<i>Ultra-Deepwater Advisory Committee (UDAC)</i> and <i>Unconventional Resources Technology Advisory Committee (URTAC)</i> chartered (Section 999D)
<b>June 2006</b>	Program consortium selected
<b>January 2007</b>	Contract with Research to Secure Energy for America (RPSEA) as the Program consortium goes into effect (calendar year contract)

## 2008 - 2010 Unconventional Resources Technology Advisory Committee Member Appointment Process

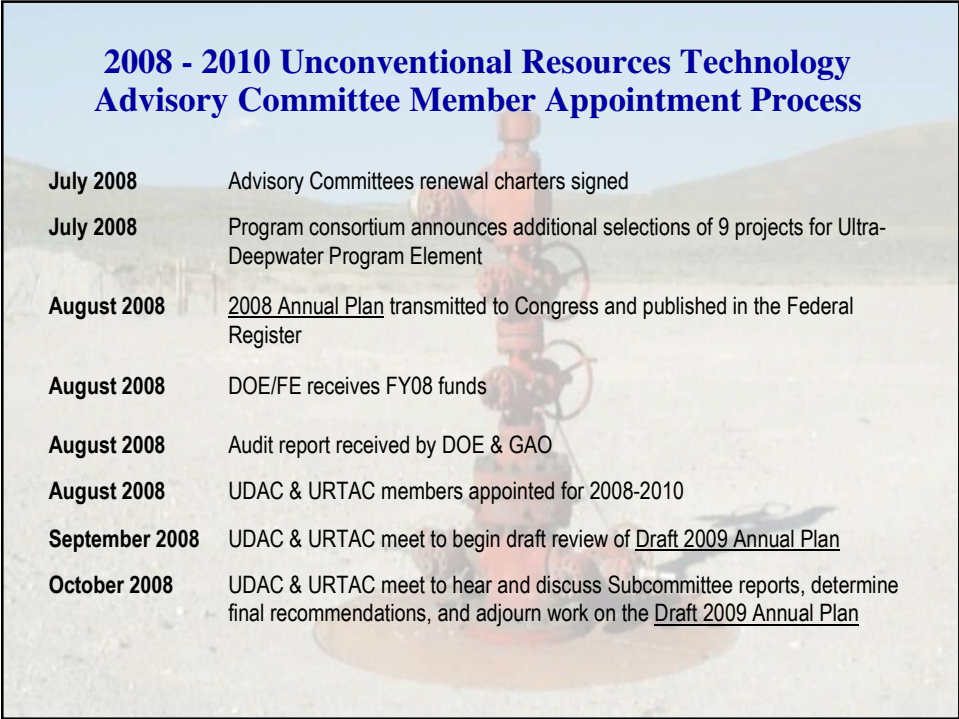
<b>May 2007</b>	UDAC and URTAC members appointed for 2007-2008
<b>June-July 2007</b>	Advisory Committees meet to review <u>2007 Annual Plan</u> and deliver written recommendations to the Secretary of Energy
<b>August 2007</b>	<u>2007 Annual Plan</u> published; DOE/Fossil Energy (FE) receives FY07 funds; RPSEA receives initial research funding
<b>October 2007</b>	Program consortium releases initial request for proposals for the Small Producer Program Element and for the Unconventional Natural Gas and Other Petroleum Resources Program Element
<b>November 2007</b>	NETL Complementary Research Program receives initial funding
<b>November 2007</b>	Program consortium releases initial request for proposals for the Ultra-Deepwater Program Element

## 2008 - 2010 Unconventional Resources Technology Advisory Committee Member Appointment Process

<b>January 2008</b>	Advisory Committees meet to review <u>2008 Annual Plan</u>
<b>February 2008</b>	<u>2007 Annual Plan</u> transmitted to Congress
<b>February 2008</b>	Program consortium selects 7 projects for Small Producer Program Element
<b>March 2008</b>	Advisory Committees meet to complete review of <u>2008 Annual Plan</u> and provide written recommendations; final report delivered to the Secretary
<b>March 2008</b>	Program consortium selects 19 projects for the Unconventional Natural Gas and Other Petroleum Resources Program Element
<b>June 2008</b>	Technical Committee [Section 999H(d)(4)] determines that the NETL Complementary Research Program is not duplicative of the consortium-administered program
<b>June 2008</b>	Fieldwork for audit completed



## **2008 - 2010 Unconventional Resources Technology Advisory Committee Member Appointment Process**



<b>July 2008</b>	Advisory Committees renewal charters signed
<b>July 2008</b>	Program consortium announces additional selections of 9 projects for Ultra-Deepwater Program Element
<b>August 2008</b>	<u>2008 Annual Plan</u> transmitted to Congress and published in the Federal Register
<b>August 2008</b>	DOE/FE receives FY08 funds
<b>August 2008</b>	Audit report received by DOE & GAO
<b>August 2008</b>	UDAC & URTAC members appointed for 2008-2010
<b>September 2008</b>	UDAC & URTAC meet to begin draft review of <u>Draft 2009 Annual Plan</u>
<b>October 2008</b>	UDAC & URTAC meet to hear and discuss Subcommittee reports, determine final recommendations, and adjourn work on the <u>Draft 2009 Annual Plan</u>

## **Attachment 6**

# Unconventional Resources Technology Advisory Committee

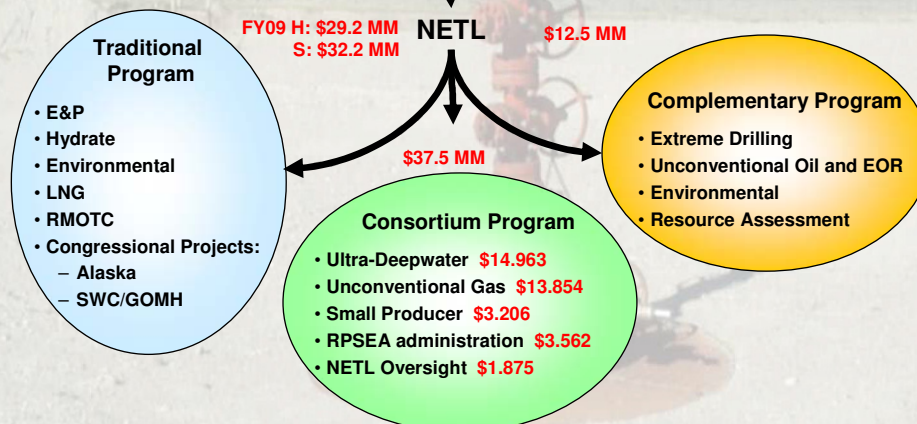
## Overview of DOE Oil & Gas Program

September 11-12, 2008

**Guide DeHoratiis**  
Acting Deputy Assistant Secretary  
Office of Oil and Natural Gas  
*Designated Federal Officer*

## Oil and Gas R&D Funding

Department of Energy  
Office of Fossil Energy



*Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources*



**Traditional and Section 999**  
**Natural Gas and Oil Technology Programs**  
*Budget (\$ million)*

	FY05	FY06	FY07	FY08	FY09 House Mark	FY09 Senate Mark
<b>NATURAL GAS</b>	43.6	32.7	12.0	19.8	25.0	20.0
<b>OIL TECHNOLOGY</b>	33.0	31.7	2.7	5.0	3.0	5.0
<b>OTHER OIL AND GAS</b>	—	—	—	22.3	1.2	7.2
<b>SECTION 999-ULTRA DEEP</b>	0	0	50.0	50.0	50.0	50.0
<b>GRAND TOTAL</b>	76.6	64.4	64.7	97.1	79.2	82.2

*Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources*

## **Attachment 7**



**NATIONAL ENERGY TECHNOLOGY LABORATORY**



## **Oil and Natural Gas RD&D Program URT Federal Advisory Committee**

**John R. Duda, Director, SCNGO**

**September 11, 2008**



Presentation Identifier (Title or Location), Month 00, 2008

## **Outline**

- **Introduction to NETL**
- **Unconventional resources**
- **R&D portfolio**
- **Status of Title IX, Subtitle J, Section 999**

## National Energy Technology Laboratory

- Only DOE national lab dedicated to fossil energy
  - Fossil fuels provide 85% of U.S. energy supply
- One lab, three research campuses
- 1,200 Federal and support-contractor employees
- Research encompasses fundamental science through technology demonstration



*Pennsylvania*



*West Virginia*



*Oregon*

## NETL Mission

*Implement research, development, and demonstration programs to resolve the environmental, supply, and reliability constraints of producing and using fossil resources*

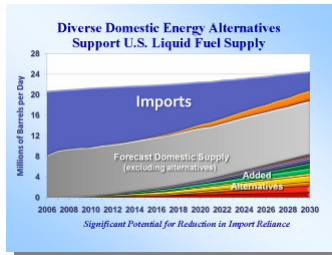


# NETL Applies Basic Science to Technology Development, Demonstration, and Transfer

## Onsite Research and Development



## Systems, Analysis, and Planning



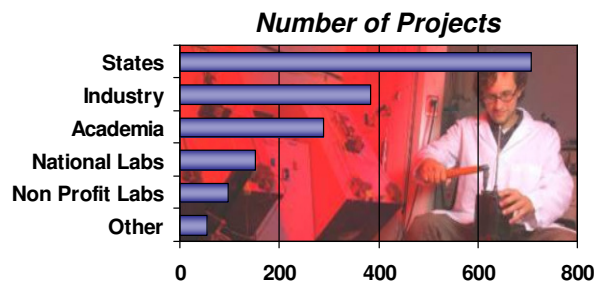
## Extramural Research and Collaboration



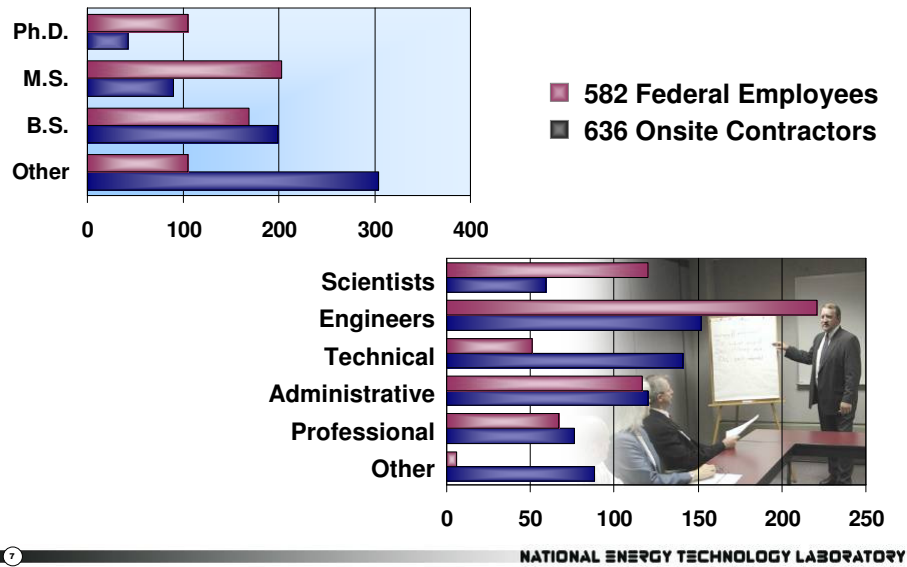
*More Than 1,800 Activities in the United States and 40+ Other Countries*

## NETL Implements & Manages Extramural RD&D

- Over 1,800 research and deployment activities in U.S. and more than 40 foreign countries
- Total award value over \$9 billion
- Private sector cost-sharing over \$5 billion
  - Leverages DOE funding
  - Accomplishes mission through commercialization
  - Ensures relevance



## A Well-Trained Workforce



## Outcomes from NETL's Programs

### Technology

- Assist in providing U.S. with clean, secure, and abundant energy in mid- to longer-term

### Policy

- Positively impact development of sound energy policies

### Competitiveness

- Help maintain technology competitiveness of U.S. energy industry

### Stability

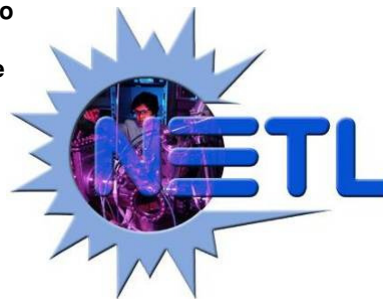
- Appropriately transfer technology to developing countries to improve geopolitical stability / global climate

### Workforce

- Provide trained energy workforce through university research programs

### Region

- Contribute to regional economic development



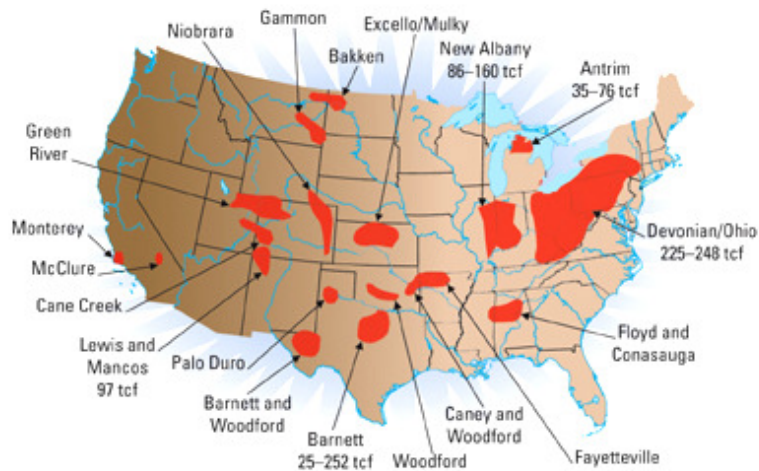
## “Unconventional” and *Frontier* Resources

- **Methane Hydrates**
  - 200,000 Tcf domestic GIP
- ***Conventional* Oil in Unconventional Formations**
  - 3.7 Billion bbls (Bakken Shale)
- **Heavy Oil**
  - 35.3 Billion bbls (NA)
- **Circum-Arctic Resources**
  - 412 Billion BOE
- **Enhance Oil Recovery**
  - 89 Billion bbls



NETL and USGS scientists collaborate on India Expedition - Aug. 2006

## Major U.S. Shale Basins



**Current estimates put the North American shale gas resource at 1,200 trillion cubic feet total gas in place**

Source: E&P Oil and Gas Investor; Hart Energy Publishing.

## NETL Natural Gas & Oil R&D Program Comprehensive R&D Portfolio



*Exploration &  
Production*



*Arctic Energy  
Office*



*Methane  
Hydrates*



*Environmental  
Solutions*



*EPACT 2005  
Title IX, Subtitle J*

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## FY2009 Budget Summary (\$ million)

	Request House Senate				
	FY07	FY08*	FY09	FY09	FY09
Exploration and Production	0	0	--	--	--
Gas Hydrates	12	15	--	25	15
Effective Environmental Protection	0	5	--	--	5
<b>TOTAL – NATURAL GAS</b>	<b>12</b>	<b>20</b>	<b>0</b>	<b>25</b>	<b>20</b>
Exploration and Production	2.7	5	--	--	5
<b>TOTAL - OIL</b>	<b>2.7</b>	<b>5</b>	<b>0</b>	<b>3</b>	<b>5</b>
<b>TOTAL TRADITIONAL PROGRAM</b>	<b>14.7</b>	<b>25</b>	<b>0</b>	<b>28</b>	<b>25</b>
EPACT Title 9, Subtitle J Consortium	37.5	37.5	--	37.5**	37.5**
EPACT Title 9, S. J Complementary	12.5	12.5	--	12.5**	12.5**
<b>TOTAL EPACT Title 9, Subtitle J</b>	<b>50</b>	<b>50</b>	<b>0</b>	<b>50**</b>	<b>50**</b>
<b>TOTAL – NATURAL GAS AND OIL</b>	<b>64.7</b>	<b>75</b>	<b>0</b>	<b>78</b>	<b>75</b>

\*Omnibus

\*\* "Silent"

Note: Excludes Congressionally Directed Projects Funding

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## ***“Traditional Program”***

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## **Methane Hydrate**

- **DOE-led interagency program**
  - Five-year authorization by EPACT 2005 Sec 968
  - Seven collaborating agencies
- **Program addresses**
  - Safety & seafloor stability
  - Global climate impacts
  - Future Resource Potential
- **Impacts**
  - Better informed ocean/climate policy
  - Potential new domestic gas resource
  - Global realignment of energy supply



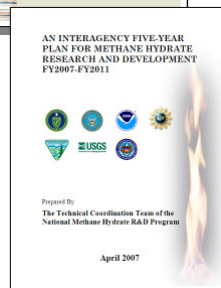
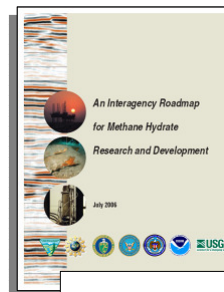
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## R&D Priorities

- Better understand controls on gas hydrate occurrence
- Better understand key remaining properties of hydrate-sediment mixtures
- Understand causes, fluxes, and fates of methane between GH systems, the ocean, and the atmosphere
- Create a validated numerical simulation capability
- Develop a validated exploration capability
- Conduct a series of multi-well marine exploration expeditions
- Conduct a series of long-term production tests leading to viable production technology



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## The Program

### NETL's Gas Hydrate R&D effort

- **Marine: Multi-site drilling and coring program**
  - Logging and coring
  - Test alternative exploration concepts/technologies
  - Data: assessment of potentially recoverable gas
- **Arctic: Long-term production testing with environmental monitoring**
  - Prudhoe Bay project (BP)
  - North Slope Borough
- **Technology Development/Modeling**
  - Field sampling and analysis tools
  - Numerical models (molecular to field scale)
  - Exploration & production systems
- **International Collaboration**
  - Japan recent proposal for extensive collaboration
  - India, China & Korea: NETL ORD personnel direct support

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## **Methane Hydrates**

### ***2008 Funding Opportunity Announcement***

- Gas Hydrate Resource Assessment and Field Testing on the Alaska North Slope
- Hydrate Production Systems Research
- Hydrate Detection and Characterization via Remote Sensing Tools
- Hydrate in the Global Environment
- **Nine Selections for Negotiation (to Award)**

## **Methane Hydrates**

### ***2008 FOA Selections***

- Gas Hydrate Resource Assessment and Field Testing on the Alaska North Slope  
**Two selections**
- Hydrate Production Systems Research  
**No selections**
- Hydrate Detection and Characterization via Remote Sensing Tools  
**Two selections**
- Hydrate in the Global Environment  
**Five selections**

## **Environmental and Unconventional Oil/EOR**

### ***2008 Funding Opportunity Announcement***

- **Produced Water, and Other Natural Gas and Oil Environmental Issues**
- **Water Management Solutions to Enable Oil Shale Resource Development**
- **Alaska Environmental Issues**
- **Unconventional Resources/EOR**
- **Alaska North Slope Heavy Oil**
- **16 Selections for Negotiation (to Award)**

## **Environmental and Unconventional Oil/EOR**

### ***2008 FOA Selections***

- **Produced Water, and Other Natural Gas and Oil Environmental Issues**
- **Water Management Solutions to Enable Oil Shale Resource Development**
- **Alaska Environmental Issues**  
**Seven selections (environmental areas)**
- **Unconventional Resources/EOR**
- **Alaska North Slope Heavy Oil**  
**Nine selections (petroleum areas)**

## 2008 Funding Opportunity Announcements

See:

[http://www.netl.doe.gov/technologies/oil-gas/EP\\_Technologies/NewProjects-090408.html](http://www.netl.doe.gov/technologies/oil-gas/EP_Technologies/NewProjects-090408.html)

<http://www.netl.doe.gov/technologies/oil-gas/FutureSupply/MethaneHydrates/NewProjects-090208.html>

### Unconventional Oil Program

- **University of North Dakota** (Grand Forks) –In this project, researchers will measure geomechanical properties and determine in situ stresses within the Bakken Formation in the North Dakota Williston Basin in order to provide basic data needed to improve the success rate of horizontal drilling and hydraulic fracturing operations in this region.

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## Arctic Energy Office Mission (Public Law 106-398)

### • Fossil Energy:

- Promote research, development and deployment of oil recovery, gas-to-liquids and natural gas production & transportation

### • Remote Power:

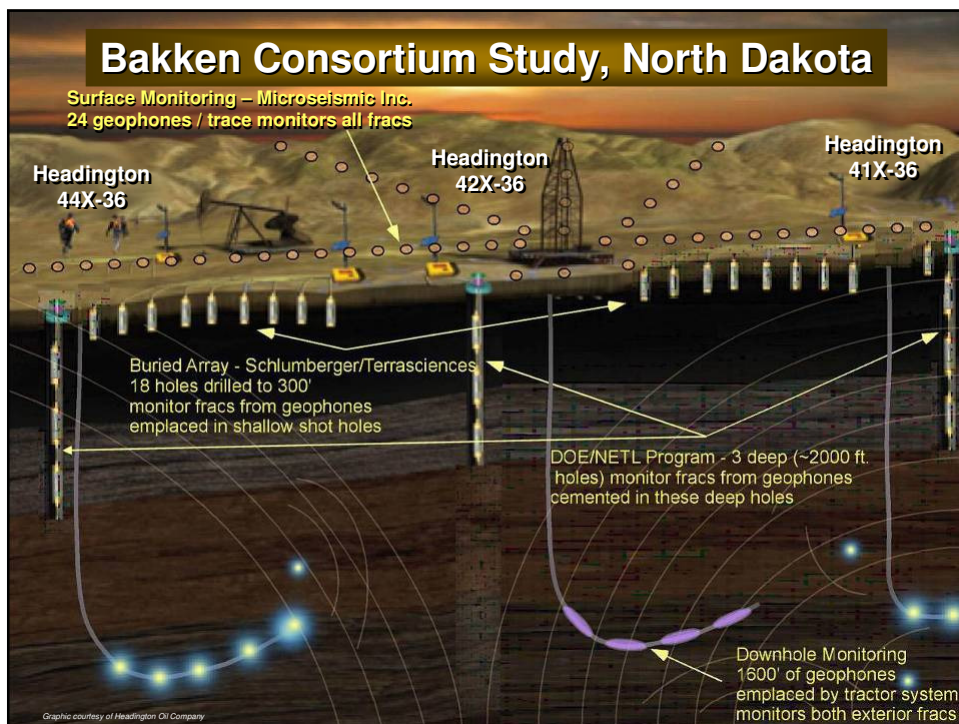
- Promote research, development and deployment of electric power in arctic climates, including fossil, wind, geothermal, fuel cells, and small hydroelectric facilities



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## Comprehensive Technology Transfer

**Brochures**

**Conference Exhibits**

**Presentations**

**Newsletters and Journals**

**NETL Website**

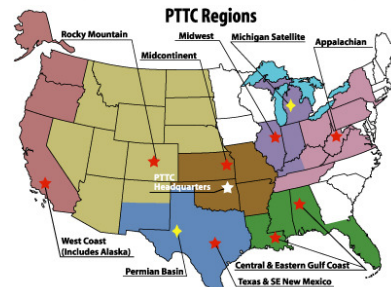
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## Petroleum Technology Transfer Council Overview

- Established in 1994 by producers, state organizations and the DOE
- Organized into 10 regional producer advisory groups
- 150 workshops/year
- 18,000 industry contacts subscribed to newsletter
- 9,000 “Tech Alert” emails mainly to independent producers in the E&P sector
- Provides strong augmentation to NETL’s core technology transfer efforts as well as other industry technologies



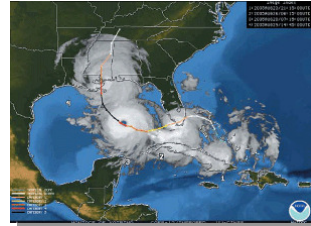
## General Accountability Office Review

- GAO report published December 2007; considered favorable
- Congressional request for follow up inquiry/Phase II effort
- SCNGO staff presentations on selected topics July 10, 2008
  - *Decision Making*
  - Methane Hydrates
  - Carbon Dioxide/EOR
  - Environmental Technologies
  - Technology Transfer
- SCNGO continues dialogue; providing backup details
  - September 17<sup>th</sup> discussion
- Final report due out in December 2008

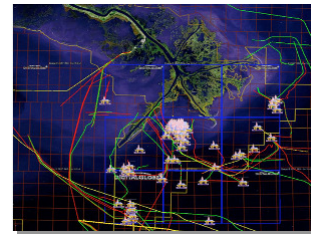
## Visualization, Simulation, Modeling and Analysis Support

- **Gulf of Mexico (GOM) Infrastructure**

- In 2005, DOE commissioned the Hurricane Recovery Team to monitor the recovery of natural gas from the Gulf of Mexico
- Leveraging existing capability, NETL developed:
  - Real-time analysis of natural gas flow from the GOM to predict shut-in and recovery, and monitor restoration
  - A statistical correlation to predict shut-in and recovery of oil flow from the GOM



Hurricane Katrina



Modeled GOM Infrastructure

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## Our Websites



*Office of Fossil Energy*  
[www.fe.doe.gov](http://www.fe.doe.gov)



*NETL*  
[www.netl.doe.gov](http://www.netl.doe.gov)

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R. Boyle, 02/07/2008

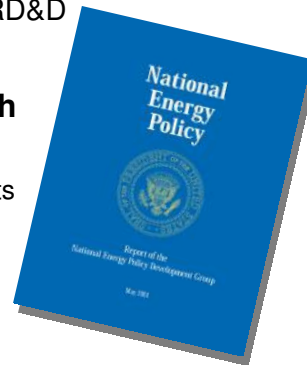
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## QUESTIONS?

## Energy Policy Act of 2005 *Title IX, Subtitle J*

- **Sec 965 - DOE Traditional Oil and Gas Program**
  - DOE conduct a program of Oil & Gas RD&D
    - E&P; oil shale; environmental
- **Sec 968 – Methane Hydrate Research**
  - DOE-led multi-agency program
    - Resource, safety, environmental impacts
- **Sec 999 – Ultra-deepwater & Unconventional Program**
  - Royalty trust fund (\$50 million/year)
  - Research at NETL (*Complementary Program*)
  - Consortium-administered R&D



## EPACT 2005, Subtitle J, Section 999

- **Contract awarded January 4, 2007**
- **Consortium-administered (\$37.5 Million)**
  - Ultra-deepwater
  - Unconventional gas
    - Low permeability sands
    - Gas-filled shales
    - Coalbed Methane
  - Technologies for small producers
  - NETL review and oversight



## EPACT 2005, Subtitle J, Section 999

- **NETL Complementary R&D (\$12.5 Million)**
  - Extreme Drilling (HT/HP)
  - Unconventional Oil and EOR
  - Environmental Impacts
  - Resource Assessment
  - Planning and Analysis



## 2008 Annual Plan

- Transmitted to Congress (August 2008)
- Funding for 2008 cycle released (Aug 12)
- Funds obligated to Program Consortium (Aug 26)
- Solicitations to be implemented (fall 2008)

## 2009 Annual Plan

- 2009 *draft* Annual Plan completed (August)
- Federal Advisory Committees reviewing in “real time”
- Federal Advisory Committees final input to Annual Plan (October 23, 2008)
- Final plan to be submitted to HQ to begin concurrence process (November 7, 2008)
  - Goal: Obtain funding coincident with Program Consortium contract year

## **Program Requirements**

### ***Title IX, Subtitle J, Section 999***

- **Technical Committee**
  - Convened on June 11, 2008
  - The committee determined that ...  
are not duplicative of the consortium-based program elements and in fact, are complementary in nature.
  - Several members of the committee noted the potential for duplication
  - The committee recommended that NETL and the program consortium continue routine and effective communications
- **Independent audit of Program Consortium**
  - GAO review of audit



## **NETL/Program Consortium**

### ***Collaborative Successes***

- NETL has developed ***Streamlined Approval Process*** to minimize the time required to approve sub-contracts
- Reduced resource burden on P-C by having NETL assume major role in benefits assessment
- Reduced resource burden on P-C by having SCNGO assume an overarching role with respect to tech transfer



## *Continuous Improvement*

- [Continue to] enhance communication

*QUESTIONS?*

# Unconventional Resources Technology Advisory Committee

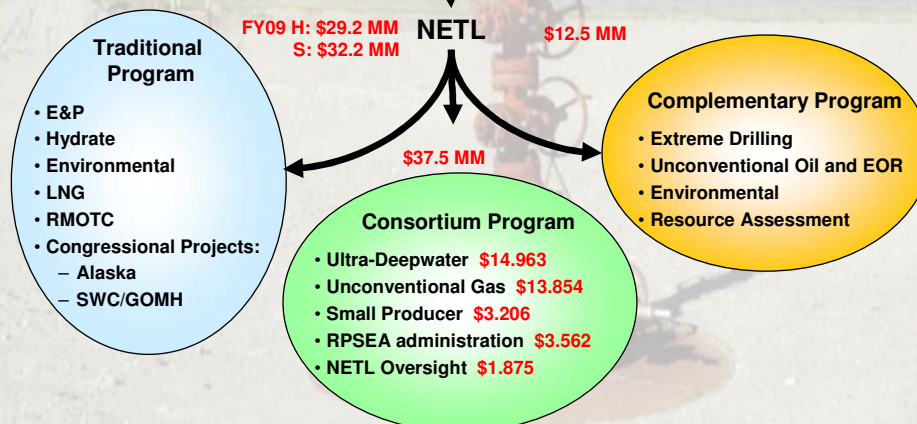
## Overview of DOE Oil & Gas Program

September 11-12, 2008

**Guide DeHoratiis**  
Acting Deputy Assistant Secretary  
Office of Oil and Natural Gas  
*Designated Federal Officer*

## Oil and Gas R&D Funding

Department of Energy  
Office of Fossil Energy



*Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources*

**Traditional and Section 999**  
**Natural Gas and Oil Technology Programs**  
*Budget (\$ million)*

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<b>OTHER OIL AND GAS</b>	—	—	—	22.3	1.2	7.2
<b>SECTION 999-ULTRA DEEP</b>	0	0	50.0	50.0	50.0	50.0
<b>GRAND TOTAL</b>	76.6	64.4	64.7	97.1	79.2	82.2

*Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources*

## **Attachment 8**





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## Natural Gas & Oil Program

Technology Transfer and Outreach  
Jim Ammer



GAO Review of Natural Gas & Oil Program, July 10, 2008

## Outline

- Importance of technology transfer
- Levels of technology transfer in the Natural Gas & Oil Program
- Vehicles for technology transfer
- Current implementation – Reaching independents and other stakeholders
- Summary

## Importance of Technology Transfer

- **Deliver research results to people who can use the information ...**
  - To make better E&P decisions
  - To reduce costs or improve performance
  - To develop and commercialize new tools or services
- **Avoid duplication of effort by other researchers**
- **Catalyze new R&D ideas and directions**
- **Enhance understanding of oil and gas technology issues among policymakers and general citizens**

## Levels of Technology Transfer

- **Program Level**: Communicate the reasons and strategies for research in a particular area (e.g., Methane Hydrates) to a broad audience; receive feedback on industry needs and priorities
- **Subprogram or Key Activity Level**: Identify the main elements of a program, why they are important and how technologies developed will move resources to reserves
- **Major Project Level**: Highlight high-profile efforts that are of major public interest (e.g., DOE/BP hydrate test well in Alaska)
- **Project Level**: Provide detailed, up-to-date information on each project funded

## Vehicles for Technology Transfer

- **Contractor presentations and publications**
  - Professional society papers and presentations, articles in scientific journals and trade press, company website postings
- **NETL outreach**
  - NETL website (contractor reports, project summaries, important findings)
  - Publications (newsletters, *Techlines*, *Factsheets*, DVD archives, meeting proceedings, atlases)
  - Participation in conferences (sponsorships, paper presentations, exhibits with handout materials)
  - NETL-authored articles in trade press (invited or proposed)
  - Petroleum Technology Transfer Council (PTTC) workshops and newsletters

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## Program Level Technology Transfer



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## “Core” Conferences 1997-2008

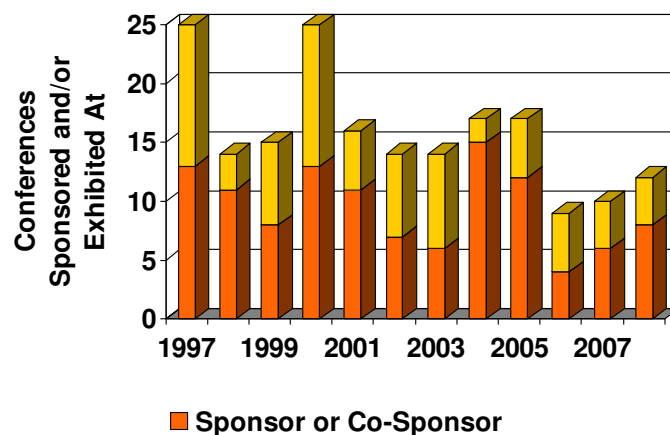
- Improved Recovery Conference (800)\*
- Offshore Technology Conference (>60,000)
- Society of Petroleum Engineers Annual Conference (8-9,000)
- International Petroleum Environmental Conference (5-600)
- American Association of Petroleum Geologists (>5,000)
- International Conference on Gas Hydrates (3-400)

\* Conference Attendance

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## Conferences Sponsored/Exhibited by NETL



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## Conference Trends 1997-2008

	Regional Events	“Core” Conferences	International Events	Hydrates	Environmental Themes
1997	4	7	2	0	5
2008	2	4	4	3	0

- Reduced number of “core” conferences
- Reduced number of regional conferences

## Participation as Speakers and Committee Members

- **Invited Talks\***
  - OTC – Hydrates Program overview
  - Specialized/Focused Workshops
    - SRI – Unconventional Gas R&D
    - Unconventional East – Past R&D on Devonian shales
    - Hedberg Conference – Unconventional Gas & Hydrates
    - Back to the Shelf – Deep Trek
    - SPE Forums – Unconventional Gas R&D, Hydrates
- **Committees\***
  - Conference Chairs (IOR, SPE, ICGH, AGU)
  - Local SPE Chapters,
  - Drilling Engineering Association

*\*Not all inclusive*

## CD/DVD Distribution (2007-08)

- 24 titles in publication
- > 1,200 copies distributed via website/library
- 1000 (est.) distributed via conferences
- Average 190 copies per month
- Most popular titles during 2007-08
  - Unconventional Natural Gas Program Archive (540)
  - Trenton-Black River Appalachian Basin Playbook (150)
  - Oil and Gas Industry Software (80)
  - Rome Trough Consortium Report (71)

## Newsletters

- ***Fire in the Ice: (Methane Hydrates)***
  - 1,250 subscribers in 17 countries, July 2008 was 25<sup>th</sup> quarterly issue
- ***GasTIPS: (Gas E&P)***
  - Quarterly joint-venture with Gas Technology Institute and Hart Publications; 21 issues from 2002 to 2007, >10,000 subscribers
- ***Eye on the Environment: (Environmental R&D)***
  - 22 issues from 1996 to 2006
- ***E&P Focus: (E&P R&D projects)***
  - 6 issues from 2005 to 2007
- ***Class Act: (EOR Class Program)***
  - 9 issues from 2000 to 2004

## Providing Independents with Relevant Information for E&P

- **Stripper Well Consortium**
  - Executive Council
  - Annual Technology Transfer Meetings
  - Products
- **Petroleum Technology Transfer Council**
  - Workshops
  - Newsletters
  - E-Mail Alerts
- **GasTIPS**

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## Stripper Well Consortium



- Industry-driven consortium est. Oct 2000
- Funded by NETL, NYSERDA, members (75)
- Operated by The Pennsylvania State University
- 88 projects funded; SWC - \$9.1 million Cost Share – \$6.5 million
- Target: small independents
- Executive Council – Majority independent operators (Bylaws)
- Two Annual Technology Transfer Meetings (NE/SW)
- Low-cost innovative technology to:
  - Increase production
  - Reduce operating costs
  - Reduce environmental footprint

[www.energy.psu.edu/swc](http://www.energy.psu.edu/swc)

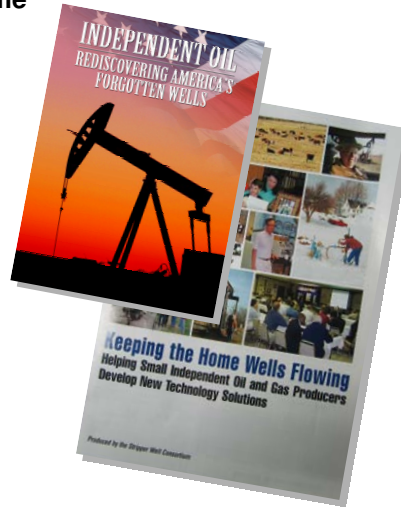


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## SWC Technology Transfer

- Developed brochure “Keeping the Home Wells Flowing: Helping Small Independent Oil and Gas Producers Develop New Technology Solutions”
- Completed “Independent Oil: Rediscovering America’s Forgotten Wells” DVD. DVD includes:
  - 30 minutes: importance of stripper wells
  - 20 minutes: technologies developed
  - > 4,000 distributed; Won Telly Award
- Developing technology section for IOGCC annual “Marginal Well” Report

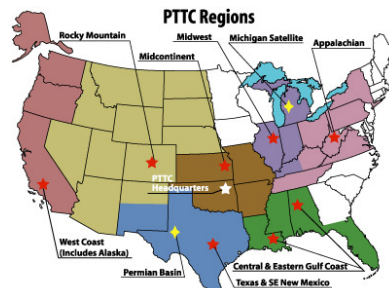


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## Petroleum Technology Transfer Council Overview

- Established in 1994 by producers, state organizations and the DOE
- Organized into 10 regional producer advisory groups
- 150 workshops/year
- 18,000 industry contacts
- Provides strong augmentation to NETL’s core technology transfer efforts as well as other industry technologies

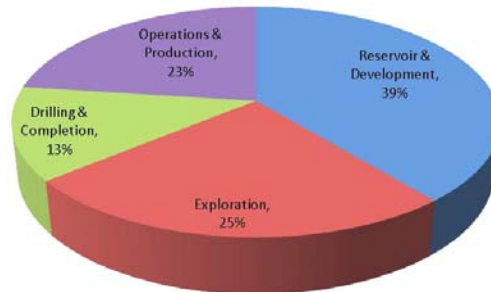


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## PTTC Workshop Topics

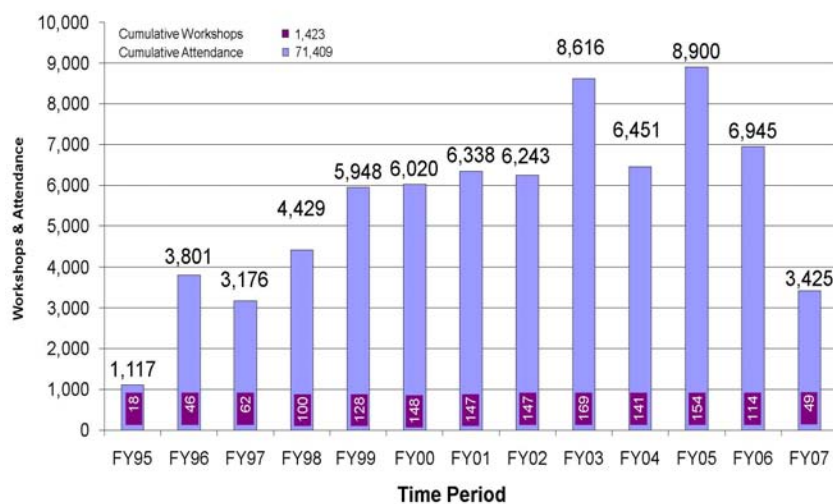


- **Reservoir & Development** (includes logging, EOR, exploitation)
- **Exploration** (gas shales, play studies, geological concepts)
- **Drilling & Completion** (horizontal drilling, microhole drilling, hydraulic fracturing)

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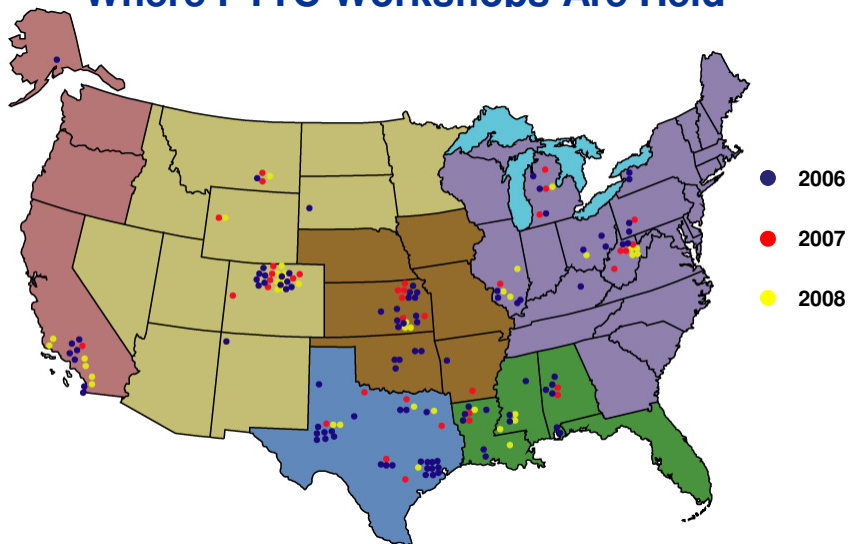
## History of PTTC Workshops



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## Where PTTC Workshops Are Held

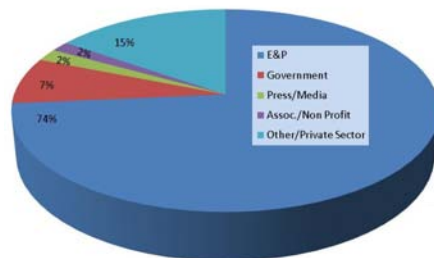


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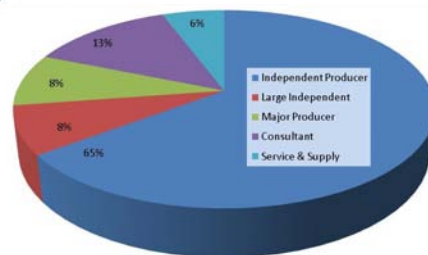
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## PTTC Newsletter Demographics (Nearly 18,000)

### Overall



### E&P Sector

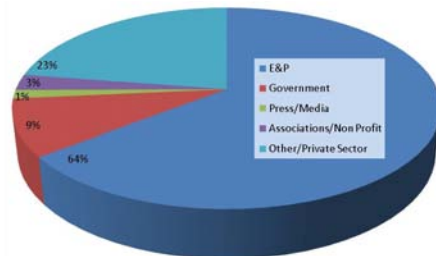


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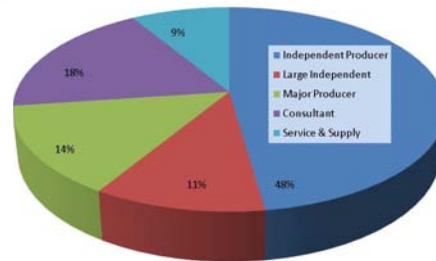
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## PTTC Email Tech Alert Demographics (Nearly 9,000)

### Overall



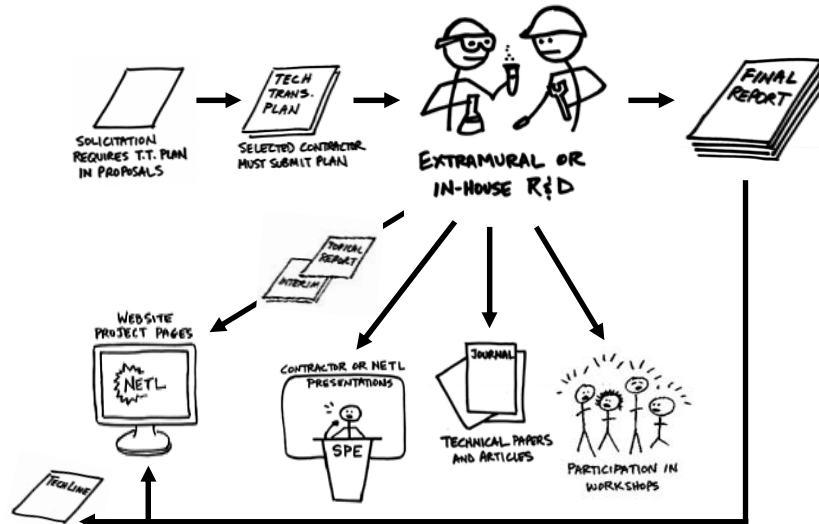
### E&P Sector



## GasTIPS

- **Quarterly publication**
  - Typically 6-7 articles on technology development or studies
  - Distributed free of charge to over 10,000 subscribers
  - Many inquiries of products or studies by industry
- Example:
  - Grand Resources read about composite pipe
  - NETL provided contact info for ACPT (developer)
  - Resulted in field test in a horizontal well
  - Led to first commercial order of composite pipe by Integrated Drilling Services

## Project Level Technology Transfer



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## Technology Transfer A Critical Element of Every Project

- Outreach or technology transfer is a significant overarching strategy of NETL's Oil & Natural Gas Program and a critical element of every project awarded by NETL
- Evaluation criteria used for project selection in the Funding Opportunity Announcement (a.k.a. *request for proposals*) includes the following, "Adequacy of the proposed technology transfer plan including any plans for commercialization or utilization of the proposed technology."
- The ultimate goal of every research project is for the technology to be commercialized and widely deployed by industry

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## Resource Assessment Example

- 1999 NPC Study recommended “improved knowledge of the size and nature of the resource base and an accurate inventory of resources in the Rocky Mountain region
  - Independents often do not own enough of the resource to conduct large-scale basin analysis
- **Forecasts of the nation’s untapped oil and gas resources provide:**
- More detailed and accurate maps of resources for high-grading exploration efforts
  - More reliable predictions of bypassed oil and gas, which will lead to more efficient infill drilling plans

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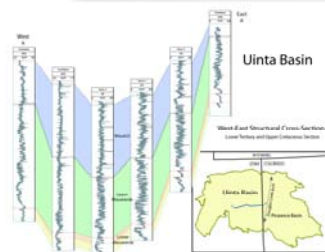
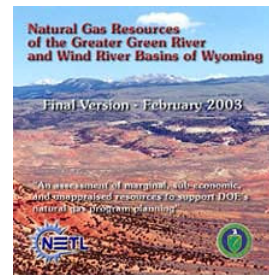
## Detailed Assessments of Unconventional Gas Basins

### Accomplishments

- Completed detailed formation-based assessments of the Greater Green River, Wind River, Deep Anadarko, and Uinta Basins
- Distributed over 5000 CD's so far, which include archived maps, cross-sections, & well data

### Benefits

- Provide industry with detailed, basin-wide reservoir information, to guide their exploration and development efforts



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Lee Krystinik, Ph.D., PGeol  
Fossil Creek Resources, LLC

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NETL / SCNG Level



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TECHNOLOGIES  
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SCNG Level

Program Level

Project Level

Major Project

Multiple Levels

A

B

C

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## Produced Water Management Info System

**Technology Information**

**Expert System**

**Regulatory Information**

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## Summary

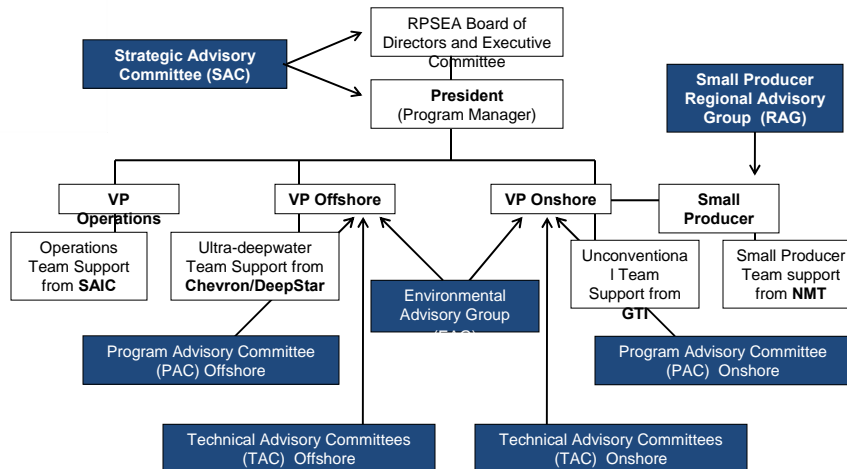
- Multi-faceted, disciplined approach matches most effective technology transfer vehicle to specific stakeholders
- “Cradle-to-grave” emphasis on technology transfer engages industry throughout process
- Two-way communication helps refine program to meet industry needs
- Very effective – reaching intended audience, especially independents

## **Attachment 9**





## A Small Organization, A Large Network



Well over 1,000 experts have participated in this process!

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## 2009 Planning Process – Unconventional Onshore Program

- **Build on 2007, 2008 Plans**
  - Workshop and Forum input, 2003-2007
  - Unconventional Resources Technology Advisory Committee (URTAC)
    - Input to 2007, 2008 plans
- **RPSEA Forums**
  - Eight held by RPSEA members
  - Late 2007 – May 2008
  - Various basins and resources
- **Industry Events**
  - Technical conferences, topical meetings
  - RPSEA staff participation
- **PAC, TAC Members**
  - Engagement in developing 2007 portfolio

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## 2009 Draft Annual Plan – Unconventional Onshore Program

- **Mission & Goal**

- Unchanged from 2007, 2008
- Economically viable technologies to allow environmentally acceptable development of unconventional gas resources
  - Gas Shales
  - Tight Sands
  - Coalbed Methane

- **Objectives**

- **Near Term**
  - Increase production & recovery from established unconventional gas resources, accelerate development of existing & emerging plays
  - Decrease environmental impact of unconventional gas development
  - Integrate project results & deliverables and engage in technology transfer to ensure application of program results
- **Longer Term**

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• Technologies for high-priority emerging & frontier resources



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## Unconventional Onshore Themes

- **Gas Shales**
  - Rock properties/Formation Evaluation
  - Fluid flow and storage
  - Stimulation
  - Water management
- **Coalbed Methane**
  - Produced water management
- **Tight Sands**
  - Natural fractures
  - Sweet spots
  - Formation Evaluation
  - Wellbore-reservoir connectivity
  - Surface footprint

Cost Reduction in All Aspects of Operations

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## Unconventional Onshore Program 2007 Projects

- **Several specific resources targeted**
  - New Albany Shale
  - Rockies Tight Sands
  - Potential Shale Resources in Alabama, Utah
- **Projects addressing unconventional gas fundamentals**
- **Vision – Use targeted resources as field laboratories for work leading to fundamental understanding of factors controlling unconventional gas production**

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## 2007 Selected Proposals

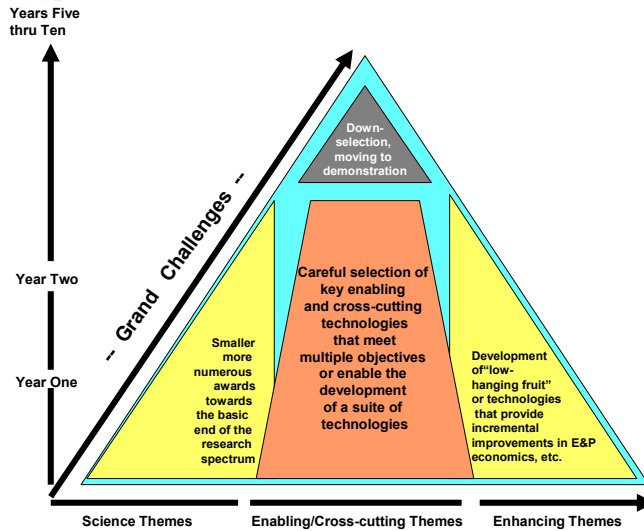
Categories	UDW	Unconventional	Small Producers	Total
Universities	5	13	6	24
National Laboratories	-	2	1	3
Nonprofit Corporation	4	1	-	5
For Profit Corporation	8	1	-	9
Geological Surveys	-	2	-	2
	17	19	7	43

## 2008 Draft Annual Plan – Onshore Program

- **Unconventional Program**
  - Emphasize role of technology transfer
  - Highlight importance of environmental signature
  - Emphasize role of individual contractors as contributors to a cooperative, integrated program
  - Focus solicitation(s) to fill portfolio gaps
    - Appalachian region
    - Water management
    - Drilling footprint in tight sands
    - Technology integration & transfer



## 2008 Draft Annual Plan – Program Balance



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## 2009 Draft Annual Plan – Onshore Program

- **Solicitation Flexibility to Build an Integrated Program**
  - Tailor 2009 solicitations to fill gaps in 2007/2008 portfolio
  - Current areas needing additional emphasis
    - Appalachian region
    - Decreasing environmental footprint
    - Water management
    - Complex, multi-zone completions
- **2009 Annual Plan Solicitations**
  - Included in “menu” form
  - Issued solicitations will include topics chosen from those specified in the plan, directed toward one of the three targeted resources
  - Choices will be driven by portfolio and results of 2007, 2008 programs.



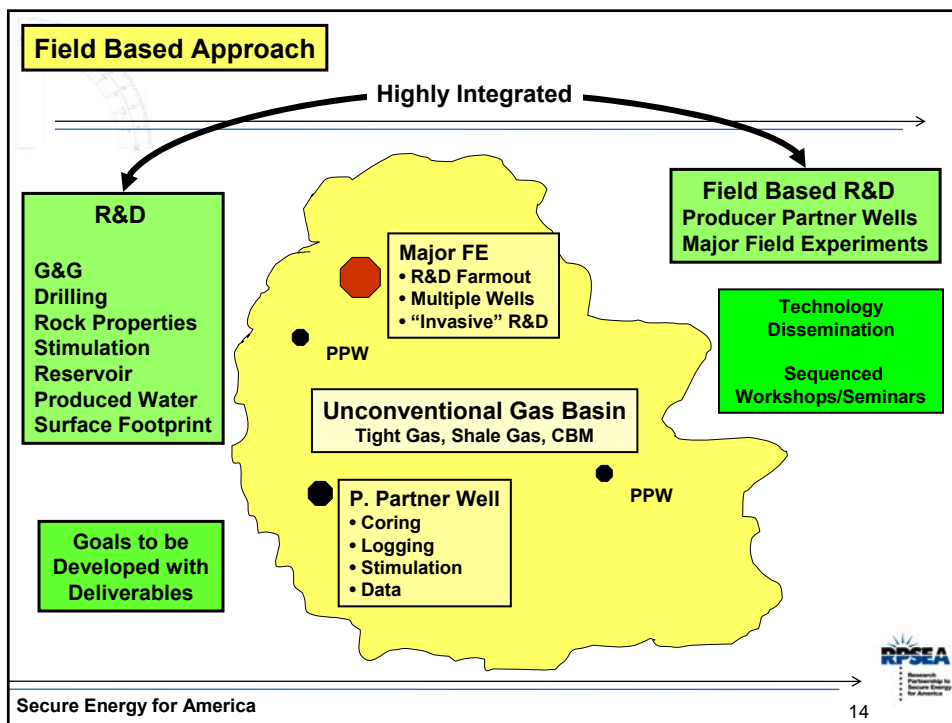
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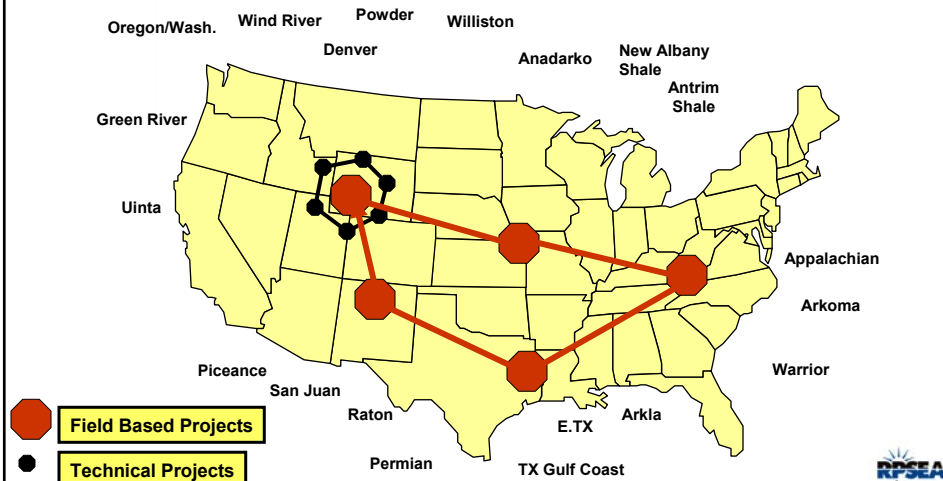


## 2009 Draft Annual Plan – Onshore Program Solicitation “Menu”

- **Integrated Program Targeting a Specific Resource**
  - Build on existing projects
  - May be comprehensive or directed toward specific technology area
  - Topic areas
    - Resource Assessment
    - Exploration Geosciences
    - Basin Analysis and Resource Exploitation
    - Drilling
    - Stimulation and Completion
    - Water Management
    - Reservoir Description and Management
    - Reservoir Engineering
    - Environmental
- **Early-Stage Research on Novel Concepts for Unconventional Gas Development**



## Integrated Program



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## 2009 Draft Annual Plan – Small Producer Program

- **Mission & Goals**
  - Unchanged from 2007, 2008
  - Increase supply from mature resources
    - Reduce cost
    - Increase efficiency
    - Improve safety
    - Minimize environmental impact
- **Objectives**
  - Near Term
    - Improve water management & optimize water use
    - Improve oil & gas recovery in mature fields, extending economic life
    - Reduce field operating costs
  - Longer Term
    - Apply developed technologies to new basins/areas and develop new technologies to address the same objectives

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## Small Producer Program - 2007 Projects

- Seven projects addressing concerns of small producers operating mature assets
  - Produced water treatment
  - Enhanced oil recovery (3)
  - Environmental impact (2)
  - Improve recovery and sweep efficiency
- Projects each involve a consortium of researchers and small producers
- Small Producer Research Advisory Group (RAG) actively involved



## 2007 Small Producer Project Selections



## 2008 Draft Annual Plan – Onshore Small Producer Program

- Slight Revisions to 2007 Plan
- Small Producer Program
  - Emphasize role of technology transfer
  - Clarify technology transfer aspects of program
  - Maintain advancing technology for mature fields focus



## 2009 Draft Annual Plan – Small Producer Program

- Awards to be made to Consortia
  - Small producers or organized for the benefit of small producers
  - Small producer:  $\leq 1000$  BOEPD
- 2009 Annual Plan Solicitations
  - Theme: Advancing Technology for Mature Fields
  - Path to initial application is critical
  - Complement 2007, 2008 project selections



## 2009 Draft Annual Plan – Small Producer Program

- **Technology Challenges**
  - Water management
  - Improve recovery/extend economic life of reservoirs
  - Reduce field operating costs and decrease environmental impact
  - Well monitoring and reservoir modeling to allow efficient field operations
  - Improved methods for well completions and recompletions
  - Field tests of emerging technology
  - Well and field data management
  - Capture and reuse of waste products to reduce costs or increase recovery
  - Leverage existing wellbores and surface footprint to maximize recovery
- **Other topics addressing the program theme of Advancing Technology for Mature Fields are**

## 2009 Draft Annual Plan – Onshore Program

- **Small Producer Program**
  - Evolutionary changes anticipated
  - Learn from experience
- **Unconventional Program**
  - Begin to form integrated program from individual projects
  - Identify and target program gaps
  - Move toward larger-scale coordination of projects to focus on specific resources

## Technology Transfer Plans

### 2.5% Set-aside for Tech Transfer in each subcontract

#### – 1.5% Project Level

- Preparing publications
- Participating in conferences & workshops

#### – 1% Program Level

- Support activities that impact multiple projects
- Regional workshops, conferences
- Topical conference
- Directed publications
- Newsletter
- Website/Database creation & maintenance (Knowledge Database)
- Technical support

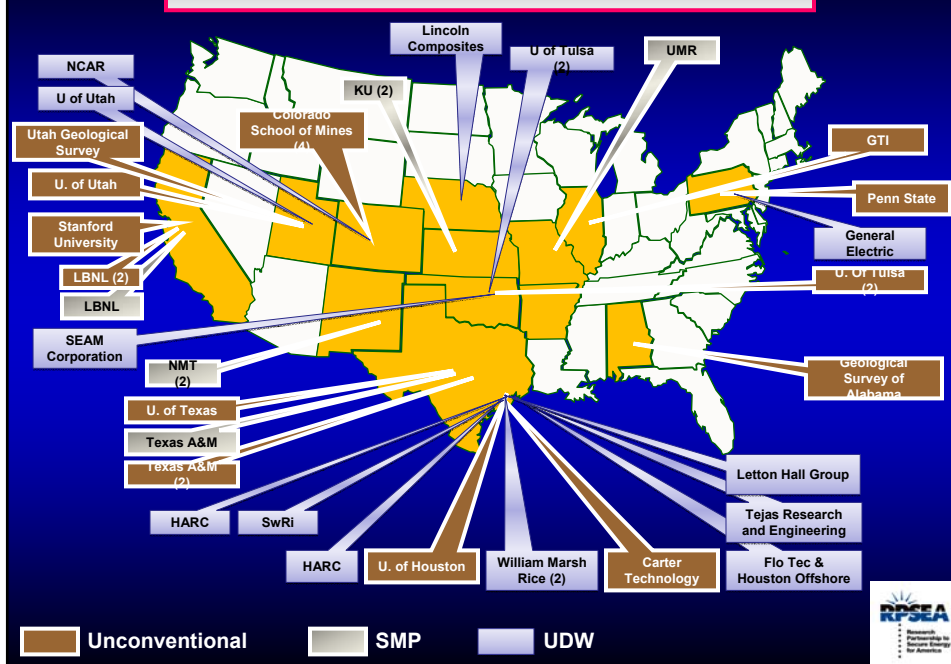
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Other novel approaches?



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## 2007 Pre-award Selection



# Questions?

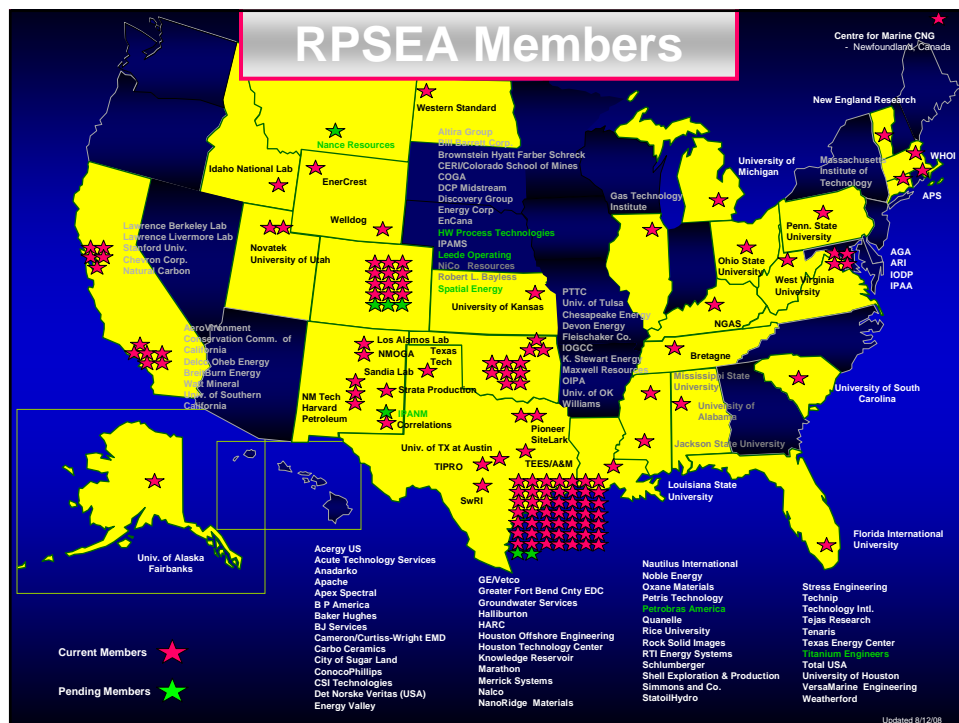


## **Attachment 10**

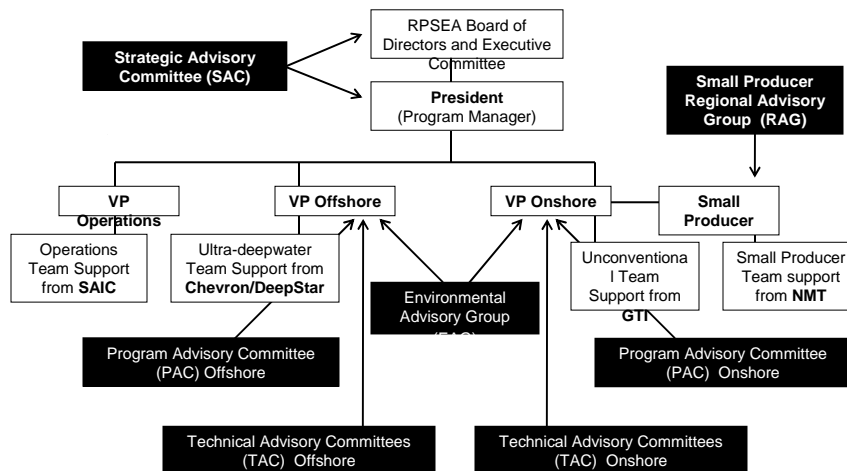


**Ultra-Deepwater Program**  
**FACA Meeting**  
**Christopher Haver**  
**C. Michael Ming**  
**Washington, D.C.**  
**September, 2008**

# Secure Energy for America



## A Small Organization, A Large Network



Well over 1,000 experts have participated in this process!

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## Contents

- UDW situation update
- 2007 UDW program review and status
- 2008 UDW program review and status
- 2009 UDW Annual Plan
- Technology Transfer

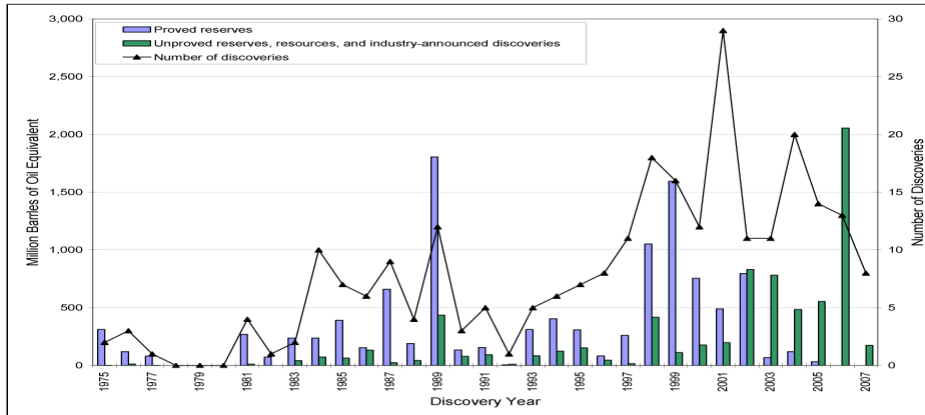
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# Increasing Lag Between Discovery and Development

## Proven Reserves Add Value



Number of deepwater field discoveries and new hydrocarbons found (MMS reserves, MMS resources, and industry-announced discoveries).

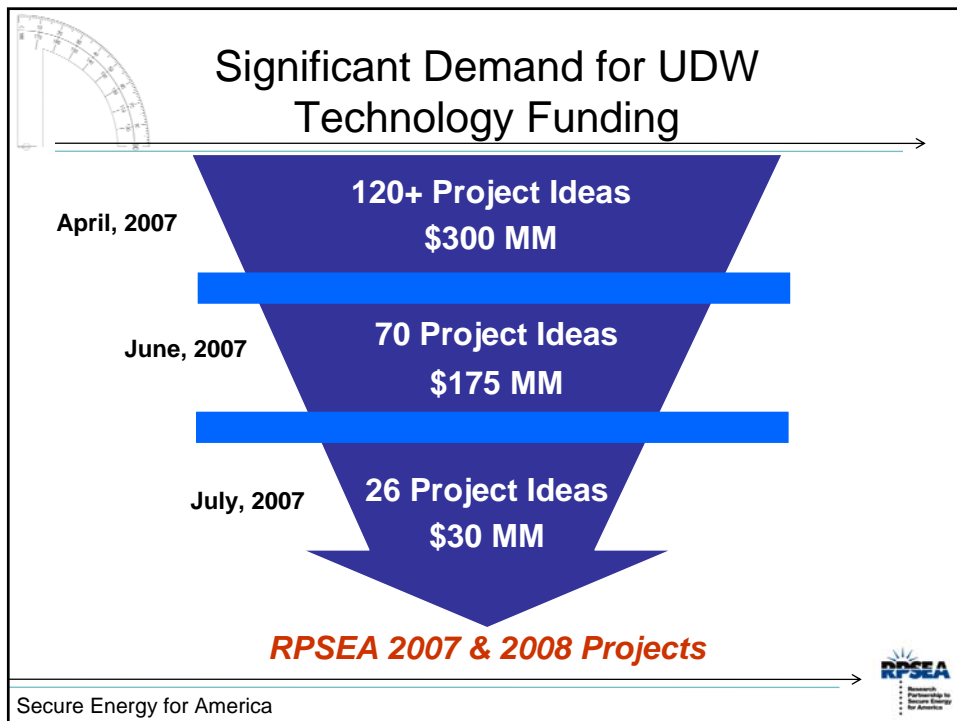
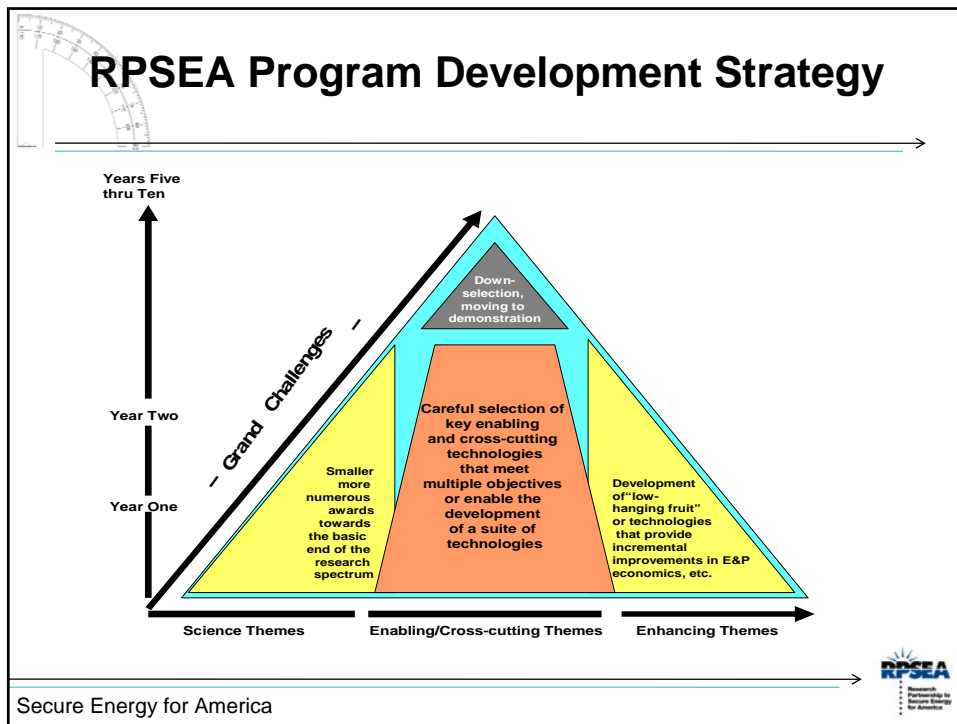
MMS Report 2008-013: Deepwater Gulf of Mexico 2008, America's Offshore Energy Future

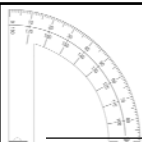


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## “Technology and Architecture Focus”

Ultra-Deepwater Resources.— Awards from allocations under section 999H(d)(1) shall focus on the development and demonstration of individual exploration and production technologies as well as integrated systems technologies including new architectures for production in ultra-deepwater.





## 2007 UDW projects

Project	Project Title	Number of bids	Selected	Award (RPSEA max)
DW1201	Wax Control	3	University of Utah	\$400,000
DW1301	Improvements to Deepwater subsea measurements	2	Letton Hall Group	\$3,564,000
DW1302	High Conductivity Umbilicals	2	Technip	\$448,000
DW1401	Composite Riser for UDW High Pressure Wells	3	Lincoln Composites	\$1,680,000
DW1402	Deepwater dry tree system for drilling production	4	FloTec / Houston Offshore	\$936,000
DW1403	Fatigue Performance of High Strength Riser Materials	2	SwRI	\$800,000
DW1501	Extreme Reach Development	2	Tejas	\$200,000
DW1603	Design investigation xHPHT, SSSV	6	Rice Univ.	\$120,000
DW1603	Robotic MFL Sensor; monitoring & inspecting risers		Rice Univ.	\$120,000
DW1603	Hydrate Plugging Risk		Tulsa Univ.	\$120,000
DW1603	Hydrate Characterization & Dissociation Strategies		Tulsa Univ.	\$120,000
DW1701	Improved Recovery	2	Knowledge Reservoir	\$1,600,000
DW1801	Effect of Global Warming on Hurricane Activity	1	NCAR	\$560,000
DW1901	Subsea processing System Integration	2	GE Research	\$1,200,000
DW1902	Deep Sea Hybrid Power Systems:	1	HARC	\$480,000
DW2001	Geophysical Modeling Methods	2	SEG	\$2,000,000

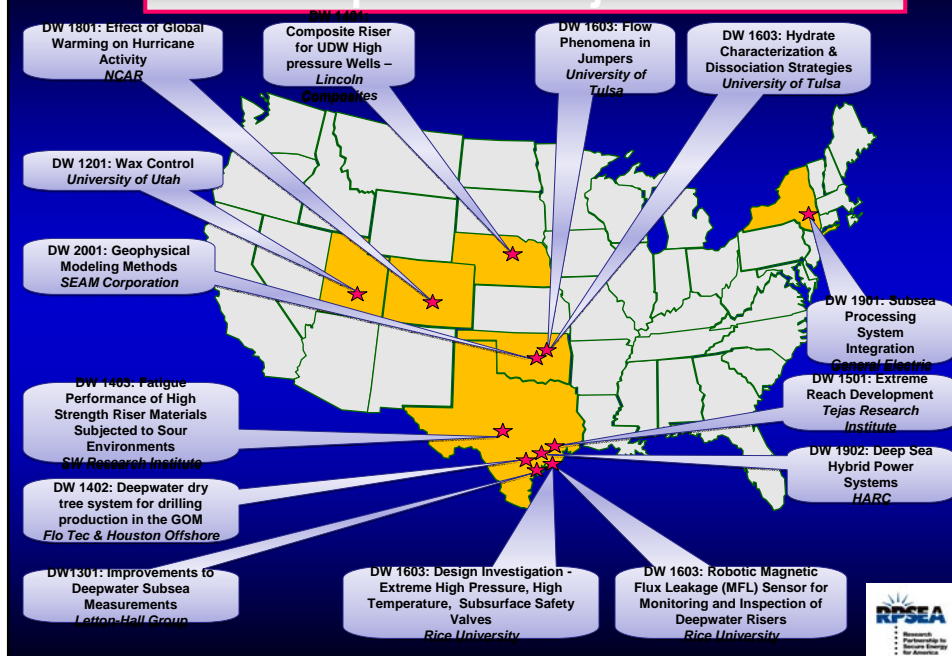
summary

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## Ultra-Deep Water Project Selections



## 2007 Selected Proposals

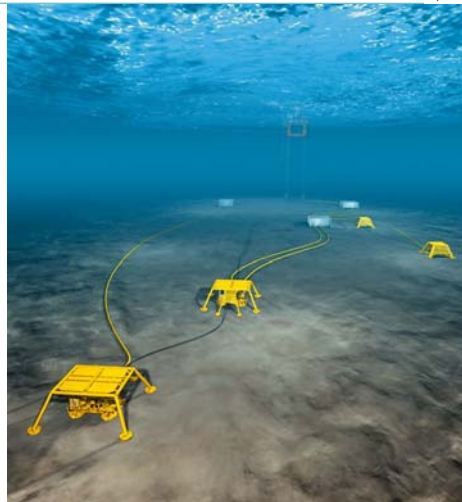
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	17	19	7	<b>43</b>

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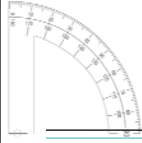
## UDW 2007 RFPs

- 4 RFPs released November 5, 2007
  - 9 proposals received December 27, 2007
- 5 RFPs released November 28, 2007
  - 13 proposals received January 28, 2008
- 5 RFPs to be released February 11, 2008
  - 10 proposals received April 14, 2008



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## 2008 UDW projects

TAC Number	Impact	2008 RPSEA Max Share
DW 2101	New Safety Barrier Testing Methods	\$ 128,000
DW 1202	EOS improvement for xHPHT	\$1,600,000
DW 2201	Viscous Oil PVT	\$460,000
DW 2301	Deepwater Riserless Light Well Intervention	\$3,411,500
DW 1502	Coil Tubing Drilling & Intervention	\$820,000
DW 2501	Early Reservoir Appraisal, Utilizing a Low Cost Well Testing System - Phase 1	\$880,000
DW 2502	Modeling and Simulation: MPD	\$384,000
DW 2701	Resources to Reserves Development and Acceleration through Appraisal	\$400,000
DW 2801	Gulf 3-D Operational Current Model Pilot	\$1,248,000
DW 2901	power distribution & components (Component Qualification)	\$4,811,000
10 Projects	Totals	\$14,142,500

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## 2008 RFP Release

- Modification of scope of work to reflect significant learnings from 2007 process – September 2008.
- Final review by Project Champions – October 2008.
- Final NETL review in late October.
- Approval by NETL to use multi-step contract and/or other contract form (?).
- Release of 2 to 3 RFP tranches.

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## 2009 UDW Annual Plan

- **Strategies:**
  - Show integrated nature of 2007 & 2008 and future programs.
  - Provide overview of each 2007 & 2008 project.
  - High level view of 2009 program direction.
  - Fewer, more general and integrated RFPs.
  - Include Environmental Issues

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## Annual Plan Strategy Development

Portfolio of Opportunities  
(Canopy, Coyote, Gumout, Diablo)

Field Development Scenarios  
(Dry Trees, Tiebacks, Produce to Beach)

Technology Needs

Initiatives (Programs)

Projects

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# GOM Ultra-deepwater Activity

- Walker Ridge /Keathley Canyon

- Sub-salt
- Deeper wells
- Tight formations

- Alaminos Canyon

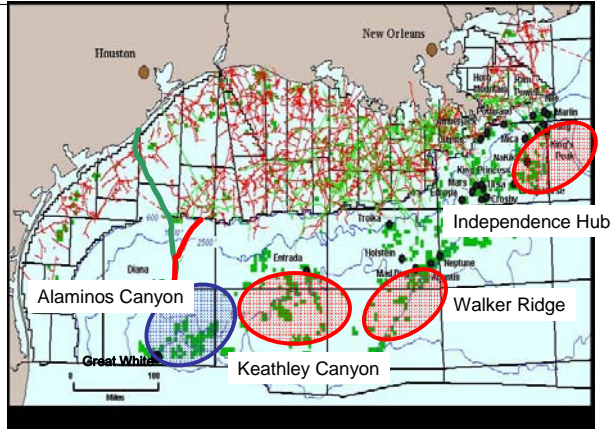
- Viscous crude
- Lacking infrastructure

- Eastern Gulf – Gas Independence Hub

- Higher pressure
- Higher Temperature
- CO<sub>2</sub> / H<sub>2</sub>S

Higher Drilling Costs

Challenging Economics

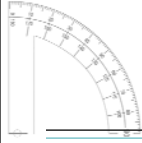


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## Ultra Deepwater Needs

- Drilling, completion and intervention breakthroughs
- Appraisal & development geoscience and reservoir engineering
- Significantly extend subsea tieback distances & surface host elimination
- Dry trees/direct well intervention and risers in 10,000' wd
- Continuous improvement / optimize field development
  - Per wellbore recovery
  - Cost reduction
  - Reliability improvements
  - Efficiency improvements
- Associated safety and environmental trade-offs



## Ongoing Needs and Initiatives

- Need 1: Drilling, Completion and Intervention Breakthroughs
  - Initiative 1: Drilling and Completions
  - Initiative 2: Intervention (Downhole Services)
- Need 2: Appraisal and Development Geoscience and Reservoir Engineering
  - Initiative 1: Exploration and Appraisal
  - Initiative 2: Field Development
- Need 3: Significantly Extend Subsea Tieback Distances/Surface Host Elimination
  - Initiative 1: Stabilized Flow
  - Initiative 2: Subsea Power
  - Initiative 3: Subsea Processing

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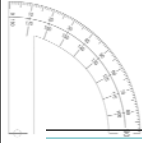
## Ongoing Needs and Initiatives

- Need 4: Dry Trees/Direct Well Intervention and Risers in 10,000 foot Water Depths
  - Initiative 1: Dry Trees/Direct Well Intervention and Risers
- Need 5: Continuous Improvement/Optimize Field Development
  - Initiative 1: Improve Operating and Inspection Processes
  - Initiative 2: Graduate Student and Long Term Research and Development
- Need 6: Associated Safety and Environmental Concerns

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## 2009 UDW Plan Strategy

- 4 to 7 Initiative-based RFPs (5 to 10 project awards)
- Unlike 2007 and 2008, however, the UDW TACs have not voted for individual projects. Rather, the TACs prioritized project ideas by initiatives.
- This input was evaluated by the PAC prior to decide the appropriate balance for the 2009 UDW program.
- UDW 2009 RFPs will consist of both specific projects (follow-on) and broader initiative-based requests. Anticipated 2009 RPSEA UDW initiatives and/or projects are listed below in the context of each UDW need.
- The actual 2009 RPSEA UDW may differ from the anticipated portfolio listed below. The actual 2009 UDW portfolio will be driven by further guidance from the UDW PAC and the timing associated with 2009 program funding.



## 2009 Anticipated Initiatives

### **Need 1: Drilling, Completion and Intervention Breakthroughs**

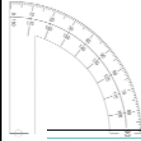
- Proposals will be requested identifying novel ideas to reduce well construction and completion costs.

### **Need 2: Appraisal and Development Geoscience and Reservoir Engineering**

- Proposals will be requested in the area of production and reservoir surveillance.

### **Need 3: Significantly Extend Subsea Tieback Distances/Surface Host Elimination**

- Proposals may be requested in one or more of the following areas:
  - Ultra-deepwater flow assurance especially for the areas of solids (asphaltenes, hydrates, waxes, and scale) deposition and plug formation management
  - Pressure boosting
  - Autonomous underwater vehicles and intervention
  - Subsea processing/produced water treatment



## 2009 Anticipated Initiatives, cont'd

### **Need 4: Dry Trees/Direct Well Intervention and Risers in 10,000' Water Depth**

- Proposals in this area to be determined.

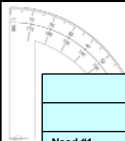
### **Need 5: Continuous Improvement/Optimize Field Development**

- Proposals in this need area may include:
  - Advancing industry understanding of phenomena impacting ultra-deepwater operations such as vortex-induced vibration
  - Improvements in integrity management and reliability
  - Additional graduate student project funding
  - High risk, high reward 'long-shot' R&D opportunities

### **Need 6: Associated Safety and Environmental Concerns**

- Ultra-deepwater efforts in this need area will involve the assessment of environmental and safety impact of RPSEA UDW funded technology development projects. This effort may take the form of individual solicitations or elements of more extensive project based solicitations. Areas of study may include:
  - Improved Metocean understanding
  - Discharge of produced water subsea – technology and regulatory aspects

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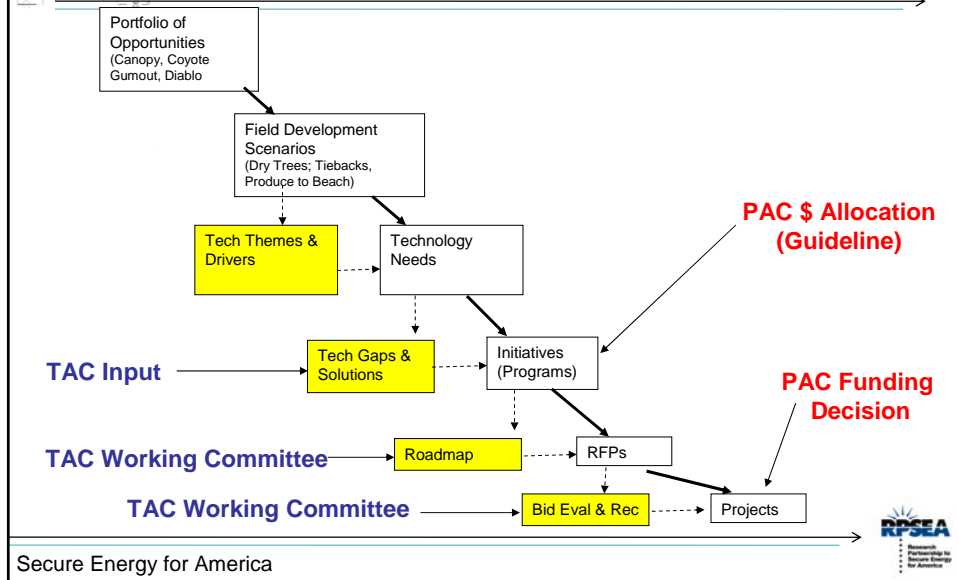
## 2009 UDW PAC Recommended Funding

RPSEA YR3 Funding Allocation (2009)		Funding Distribution (\$k)		
	Title / Description	Low	High	Average
<b>Need #1</b>	<b>Drilling Completion and Intervention Breakthroughs</b>			<b>6,250</b>
1	Drilling	2,000	5,000	3,500
2	Completions	1,000	3,000	2,000
3	Intervention (Downhole Services)			-
4	Intervention (In-Water IMR)	500	1,000	750
5	Extended Well Testing			-
<b>Need #2</b>	<b>Appraisal &amp; development geosciences and reservoir engineering</b>			<b>1,500</b>
6	Reservoir Surveillance	1,000	2,000	1,500
<b>Need #3</b>	<b>Significantly extend subsea tieback distances / surface host elimination</b>			<b>3,625</b>
7	Stabilized Flow	750	1,500	1,125
8	Subsea Power			-
9	Subsea Processing, Pressure Boosting, Instrumentation and Controls	2,000	3,000	2,500
<b>Need #4</b>	<b>Dry trees / Direct well intervention and risers in 10,000' wd.</b>			<b>-</b>
10	Riser Systems			-
11	Dry Tree Structures			-
<b>Need #5</b>	<b>Continuous Improvement / Optimize field development</b>			<b>3,000</b>
12	Long Term Research and Development and Graduate Student Program	1,000	2,000	1,500
13	Sensors, tools and Inspection Processes	1,000	2,000	1,500
	Bridging and Contingency	500	750	625
<b>Need #6</b>	<b>Associated Safety and Environmental Concerns</b>			<b>500</b>
14	Environmental Issues	250	750	500
		10,000	21,000	14,875

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# 2009 Annual Plan Process



## Technology Transfer Plans

### 2.5% Set-aside for Tech Transfer in each subcontract

- 1.5% Project Level
  - Preparing publications
  - Participating in conferences & workshops
- 1% Program Level
  - Support activities that impact multiple projects
  - Regional workshops, conferences
  - Topical conference
  - Directed publications
  - Newsletter
  - Website/Database creation & maintenance (Knowledge Database)
  - Technical support

Secure Energy for America • Other novel approaches?

# What Questions Can I Answer?



Christopher Haver  
DeepStar Director, Chevron ETC  
RPSEA Offshore VP

[chaver@chevron.com](mailto:chaver@chevron.com)  
[www.rpsea.org](http://www.rpsea.org)  
[www.deepstar.org](http://www.deepstar.org)

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## **Attachment 11**




**Department of Energy**  
Washington, DC 20585

April 9, 2008

**MEMORANDUM**

**TO:** STEVEN J. ISAKOWITZ  
CHIEF FINANCIAL OFFICER

**FROM:** JAMES A. SLUTZ   
ACTING PRINCIPAL DEPUTY ASSISTANT SECRETARY  
OFFICE OF FOSSIL ENERGY

**SUBJECT:** Benefits Assessment Plan for the EPO Act Section 999, Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Consortium-Administered R&D Program

The *2007 Annual Plan* for the above program included discussion and comments on the benefits associated with the program. Attached is the plan for assessing the benefits resulting from the Consortium-administered elements of the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research & Development Program.

The plan describes our efforts to: develop the methodology, set up an independent panel to review and vet the methodology, test and validate the methodology, conduct the initial analyses, subject the analyses to independent merit review, and present the first set of program benefits.

If you have any questions, please call Ms. Elena Melchert or Mr. Bill Hochheiser of my staff at 202/586-5095.



## Assessing Benefits of the 2005 EPACT, Subtitle J, Section 999 Consortium R&D Program

### 1. Introduction

DOE will undertake a comprehensive benefits analysis that evaluates a full range of impacts stemming from the program over the next few decades. This comprehensive effort, including integration of the estimated increase in royalty payments, if any, is the focus of this document.

### 2. Benefits Identification

The methodology to be developed for assessing benefits should account for key impacts that can be measured, estimated or inferred from historical data and models of future performance. The various types and categories of benefits can be characterized by a *benefits matrix* and the methodology should reflect these types of information.

In 2001, a National Research Council (NRC) committee conducted a retrospective study<sup>1</sup> of the benefits of some of the energy efficiency and fossil energy programs in the U.S. Department of Energy (DOE). As part of its study, the NRC committee developed a methodological framework for estimating these benefits. Following the NRC report, a conference was organized by Oak Ridge National Laboratory to discuss ways of adapting and refining the NRC framework for possible use by DOE offices to help plan and manage their R&D.<sup>2</sup> This matrix below defines this general framework.

**Benefits Matrix**

	Past	Future	
	Realized	Projected	Option Cases
Economic			
Environmental			
Security			
Knowledge			

The rows reflect the Section 999 R&D program's strategic objective: to provide direct economic, environmental, and security benefits, or to provide knowledge that can indirectly lead to these benefits. The columns reflect *when* the benefits occur (past in the sense that once R&D results begin to have an impact, measured benefits will be realized) and future in that expected benefits will need to be estimated. Initially of course, all benefits will be estimated future benefits. Given the range of future scenarios in terms of the parameters that directly impact measured benefits (e.g., oil and natural gas prices, or the rate of commercialization of a new technology), a number of option cases or scenarios will need to be constructed reflecting varying degrees of certainty.

Many participants in the Oak Ridge conference suggested that *knowledge* is a core mission of both basic science and applied science R&D programs managed by DOE, as well as of some of the energy resource programs. Also, many participants thought that various types of knowledge are enablers of innovation. They suggested that knowledge could be viewed as a third dimension

<sup>1</sup> National Research Council's Committee on Benefits of DOE R&D on Energy Efficiency and Fossil Energy, 2001, *Energy Research at DOE: Was It Worth It?*, Washington, DC: National Academy Press, July.

<sup>2</sup> Lee, R., et al., 2003, "Estimating the Benefits of Government-Sponsored Energy R&D: Synthesis of Conference Discussions," Oak Ridge National Laboratory, March.



## **Assessing Benefits of the 2005 EPACT, Subtitle J, Section 999 Consortium R&D Program**

of the matrix to convey the idea that various types of knowledge contribute to other types of benefits.

The notion that knowledge is a benefit that needs to be accounted for has been supported by recommendations made by the Federal Advisory Committees formed to advise the Secretary on this program. They have specifically called for DOE to create a “knowledge management database” that will archive all of the data and analytical products that are created by the various research efforts during the course of the research and to implement a process to push this knowledge out to end users as soon as possible.

While it will be difficult to quantify benefits that accrue as the result of knowledge being made available to other researchers (e.g., when EPACT Section 999 research data provides knowledge that eliminates the need for another researcher to perform a similar experiment, provides an insight that leads that person to redirect their work in a more fruitful direction, or provides evidence that certain alternatives do not work, etc.), an effort to track the use of this knowledge and determine its benefit to individual end users will be considered as the overall methodology is being developed.

### **3. Validation Process**

A method for validating the estimated benefits associated with the application of specific Program-developed technologies will be incorporated into the overall process. This may include “before-and-after” estimates from the operators involved with demonstrating a technology, market penetration estimates and “case histories” from service companies involved in commercializing a Program-developed technology, or via inputs from RPSEA Consortium members and other operators that apply the technology in the field.

Depending on the specific R&D project and the nature of the technology being developed, this validation process may involve actual measured data or best-available estimates. It will be important to make every effort to include operators/companies that are not directly involved in the project in this validation process, although the level of detail such companies can supply may be hindered by the proprietary nature of some of the data involved.

This portion of the methodology may draw from models for estimating such long-term benefits that have been employed in the past by DOE as well as models used in other industries where assessments of long-term R&D benefits are needed to justify near-term R&D investments.

The methodology will need to be well-grounded in an understanding of the nature and speed of technological innovation and uptake within the domestic U.S. oil and gas industry. Part of this understanding may come from consultations with technology experts within the RPSEA advisory committee and Federal Advisory Committee membership.

### **4. Independent Review**

An independent critical review of the benefits assessment *methodology* and data requirements is planned prior to the methodology being finalized. This independent review will include a panel of experts, the members of which are not associated with the R&D performers yet collectively are well-recognized for their knowledge in the following areas:



## Assessing Benefits of the 2005 EPACT, Subtitle J, Section 999 Consortium R&D Program

- Assessment of benefits from R&D investments
- Economic evaluation of oil and gas investments
- Technology trends in oil and gas exploration and development
- Methods for assessing the impact of industrial activity on national economies

### 5. 2008 Milestones for Methodology Development

*Includes regular discussions/briefings with RPSEA staff and HQ staff*

#### April

- Discuss options and planned approaches to benefits analysis, including data requirements from R&D contractors, with RPSEA staff and HQ staff.
- Initiate identification of the models, methods, approaches, and data requirements available for completing the assessment

#### May

- Complete evaluation of strengths/weaknesses of various approaches to benefits assessment including their applicability to the Section 999 R&D program
- Select a preferred approach for conducting the benefits assessment

#### June

- Begin process of identifying and contacting prospective members of an independent panel of reviewers (for September merit review)
- Vet preferred methodology and data requirements [informal process]

#### July

- Conduct initial *validation testing* of the preferred benefits assessment methodology
- Continue planning for a merit review

#### August

- Modify assessment methodology based on earlier *validation testing* and [informal] review comments
- Complete materials for September merit review of the benefits assessment methodology

#### September

- Subject the benefits analysis methodology and data requirements, including those related to estimating increases in royalty collections to an independent merit review

#### October

- Revise/finalize benefits analysis methodology plan based on results of the formal merit review
- Begin to develop baseline resource/technology information for each benefit category
- Begin purchase or acquisition of data and other model inputs as needed, based on final reviewed methodology

#### November

- Finalize and submit the benefits assessment methodology to HQ
- Complete draft Royalties Report to Congress (2nd baseline report)

#### December

- Deliver a final *Royalties Report to Congress* to HQ

## Assessing Benefits of the 2005 EPACT, Subtitle J, Section 999 Consortium R&D Program

### REFERENCES

- Lee, R., G. Jordan, P. Leiby, B. Owens, J. Wolf, 2003, "Estimating the Benefits of Government-Sponsored Energy R&D: Synthesis of Conference Discussions" (a summary of discussions at a conference held on March 4 and 5, 2002 in Arlington, Virginia, organized by Oak Ridge National Laboratory and sponsored by the Office of Energy Efficiency and Renewable Energy; Office of Fossil Energy; Office of Nuclear Energy, Science and Technology; and Office of Science of the U.S. Department of Energy), March.
- National Research Council's Committee on Benefits of DOE R&D on Energy Efficiency and Fossil Energy, 2001, "Energy Research at DOE: Was It Worth It?," Washington, DC: National Academy Press, July.

## **Attachment 12**



NATIONAL ENERGY TECHNOLOGY LABORATORY



## Analysis & Planning/Complementary Pgm URT Federal Advisory Committee

John R. Duda, Director, SCNGO  
September 12, 2008



Presentation Identifier (Title or Location), Month 02, 2008

## Outline

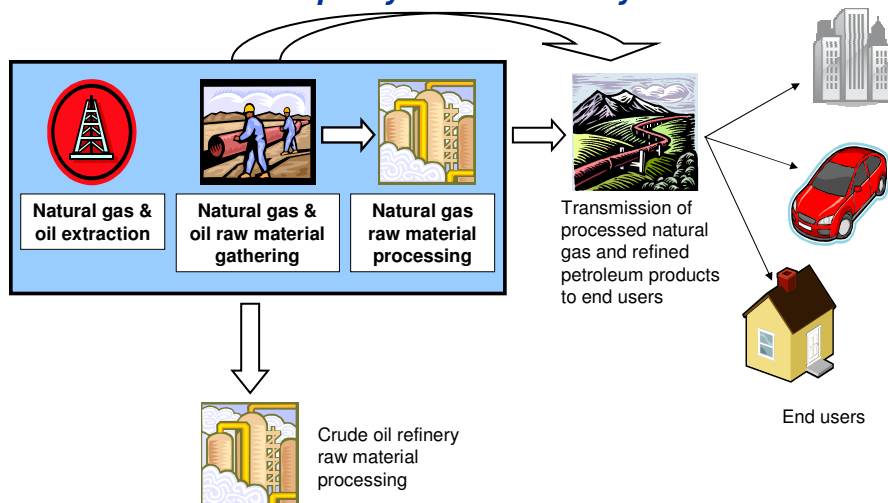
- **Systems Analysis and Planning**
- **Activities**
  - Valuing domestically produced oil and natural gas
  - Life Cycle Assessment of alternative transportation fuels
  - *PRB CBM MSC* update
  - Benefits assessment

## Systems Analysis and Planning

- **Analysis focusing on the future state of technologies, markets, and public benefits**
  - Evaluate attributes of energy technologies
  - Assess trends of energy production and use
  - Prospective and retrospective benefits analysis

## Valuing Oil and Natural Gas Production

*Scope/System Boundary*



## Valuing Oil and Natural Gas Production *Project Details*

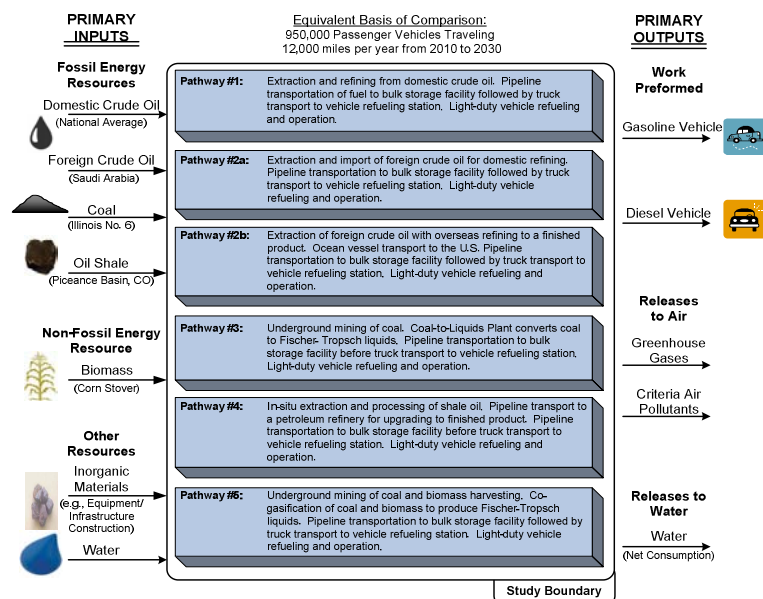
- **NETL and WVU**
  - Data analysis and model development
- **Project Schedule & Budget:**
  - Scheduled for completion: December 31, 2008
  - \$131K
- **Merit Review (September 5, 2008)**
  - Review methodology and model operation
  - Obtain feedback to improve project before moving into scenario analysis phase
  - “9.1”

9

Updated 02/25/2008

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## LCA Study Boundary

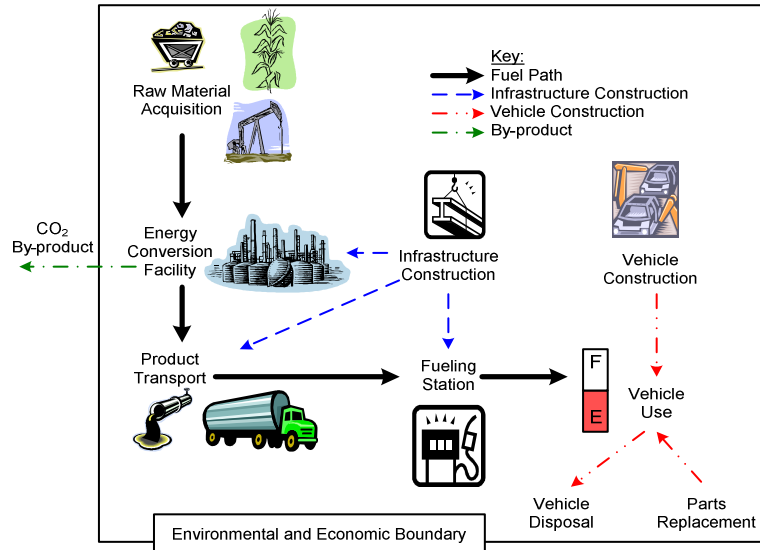


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Updated 02/25/2008

NATIONAL ENERGY TECHNOLOGY LABORATORY

## LCA Conceptual Boundary



Updated 02/25/2008

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## Powder River Basin CBM MultiSeam Completion Study

### Results From All Townships in Partition 8

MSC Technology enables the *thin* (<20') coals in Partition 8 to be completed, increasing recoverable CBM by 2118 Bcf.

Coal Seam	Single Seam Completion		Multi Seam Completion	
	GIP (Bcf)	Recoverable Gas (Bcf)	GIP (Bcf)	Recoverable Gas (Bcf)
Smith	165	83	274	137
Swartz	143	71	294	147
Anderson	657	345	857	451
Canyon	1,434	1,008	1,625	1,142
Cook	1,378	1,059	1,710	1,315
Wall	1,132	912	1,508	1,214
Pawnee	663	551	1,230	1,023
L. Pawnee	268	223	540	449
Cache	102	85	511	424
Oedekoven	353	293	536	446
<b>Total</b>	<b>6,296</b>	<b>4,630</b>	<b>9,087</b>	<b>6,748</b>

Updated 02/25/2008

NATIONAL ENERGY TECHNOLOGY LABORATORY

## Benefits Analysis “Framework”

- **Develop project-level analyses**
  - Essentially develop a “business plan” for each project
  - Use existing methodology and data, as applicable
  - Embrace expert judgment where needed
  - Develop transparent calculations for market penetration forecasts and benefits
- **Once project level analyses are in hand, identify unifying themes, estimate aggregate benefits**
- **Collaborate with Dept. of Interior to derive royalty impact estimates**
- **Benefits assessments to evolve with the projects**

## Benefits Analysis “Milestones”

- **Assess portfolio of projects**
- **Evaluate applicability of models**
- ***Appreciate* data requirements**
- **Secure *global* data**
- **Select preferred methodology for approach**
- **Test model**
- **Merit review (planned for January 2009)**
- **Initiate scenario analysis**



## **Complementary Program** *...continued*

- **Questions?**
- **David Wildman**
  - Office of Research and Development

## **Attachment 13**



**NATIONAL ENERGY TECHNOLOGY LABORATORY**



**Title IX, Subtitle J (EPA Act 2005)  
Complementary Program - Office of  
Research and Development**

September 2008



Presentation Identifier (Title or Location), Month 00, 2008

## Complementary Program NETL - ORD

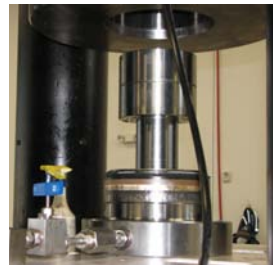
- **Areas of research**
  - Drilling Under Extreme Conditions
  - Environmental Impacts of Oil and Gas
  - Enhanced and Unconventional Oil Recovery
  - Resource Assessment
- **Institute for Advanced Energy Solutions**
  - West Virginia University, Carnegie-Mellon University, and University of Pittsburgh
    - Penn State University and Oregon State University

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## Drilling Under Extreme Conditions

- **Ultra-deep single cutter drilling simulator**
  - Recreates bottom-hole drilling environment of ultra-deep wells (30,000 psi and 481°F)
  - Delivered to NETL later this year
  - Operates with real drilling fluids
  - X-ray video system images cuttings
  - Verify the results of the full bit simulator performance at 10 ksi performed by TerraTek
    - Extend their results by performing tests up to 30 ksi
  - Use discrete element modeling approach to incorporate loading on the drill bit generated by the rock cuttings



Fabrication at  
TerraTek

4

NATIONAL ENERGY TECHNOLOGY LABORATORY

## EDL Supporting Instrumentation

- **Integration of an Abrasive Water Jet Cutter into lab for optimal sample prep**

- Prepares defect-free rock samples
- Able to cut small samples from sample for microscopic examination



- **Integration of a Confocal Laser Scanning Microscope for pre-test & post-test rock analysis**

- Optical resolution to 120 nm (xy plane)
- Optical resolution to 10 nm (z axis)



- **Integration of Chandler Model 7600 viscometer for HPHT rheology measurements**

- Quantify drilling fluid properties at UDS test conditions



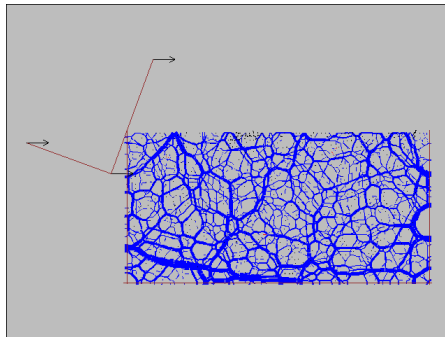
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NATIONAL ENERGY TECHNOLOGY LABORATORY



Carnegie Mellon

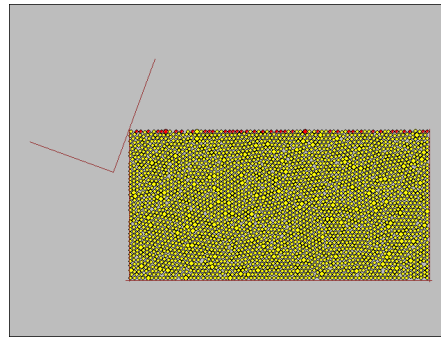
## Initial Discrete Element Method Modeling Result -Trial Run of PFC2D



Blue: compression force chain

Red: tension force chain

Initially in isotropic compression. As cutter moves in, more area is affected.



Particle movement as cutter advances.  
The segmentation pattern is a function of the stress level and bond characteristics.

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NATIONAL ENERGY TECHNOLOGY LABORATORY

## DUEC – Materials/Sensors

### •HPHT materials development and performance

- Obtain field samples that have failed under HPHT drilling conditions ([primary source: RPSEA members](#))
- Determine HPHT failure mechanisms and develop a laboratory evaluation technique
- Improve resistance to corrosion, wear, corrosive wear and fatigue.
  - Cylinder-on-anvil apparatus for wear/corrosion testing
- Develop laboratory scale tests that accurately predict performance in HPHT conditions.
- Develop low cost coatings for Fe alloys used in drill pipe-casing systems
- Application of computational approaches for developing alloys resistant to fatigue under extreme drilling conditions (Jamie Kruzic, Oregon State University (OSU))
- **Ultimate goal: New alloys for drilling, completion, and production in HPHT environments**



**Cylinder-on-anvil apparatus**

### Sensor development (CMU)

#### •Initiated SiC electronics for deep drilling

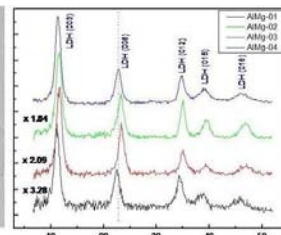
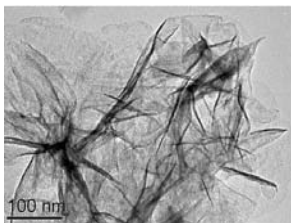
- Design a HT operational amplifier or oscillator prototype
- Fabricate via Cree SiC process

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NATIONAL ENERGY TECHNOLOGY LABORATORY

## Nano-fluids for Oil and Gas Applications

- **Laser synthesis and characterization of (Mg-Al) layered double hydroxides (LDHs) nanostructures and other nano-materials (Al, Mg, Fe, Ni, Cobalt, ...)**
  - Determine ablation and laser conditions for morphology, structures, surface functionalization
  - Optimize ablation rate
- **Test for application as drag reduction, drilling fluids, fracturing fluids, or as a drilling fluid enhancer**



**Mg<sub>6</sub>Al<sub>2</sub>(OH)<sub>18</sub> 4.5 H<sub>2</sub>O nano-structure**

8

NATIONAL ENERGY TECHNOLOGY LABORATORY

## Drilling Under Extreme Conditions FY09 Plans

- **Incorporate various modeling activities into Extreme Drilling Lab activities**
  - Debug UDS to full design capabilities
  - Calibrate Models
  - Modelers to suggest test plans to prove hypothesis routed in numerical modeling results.
  - Seek out optimal placement / characteristics of drilling fluid around the cutter-rock interface.
- **Identify failure mode of commercial HPHT materials**
- **Produce sufficient quantities of nano-fluids for characterization**

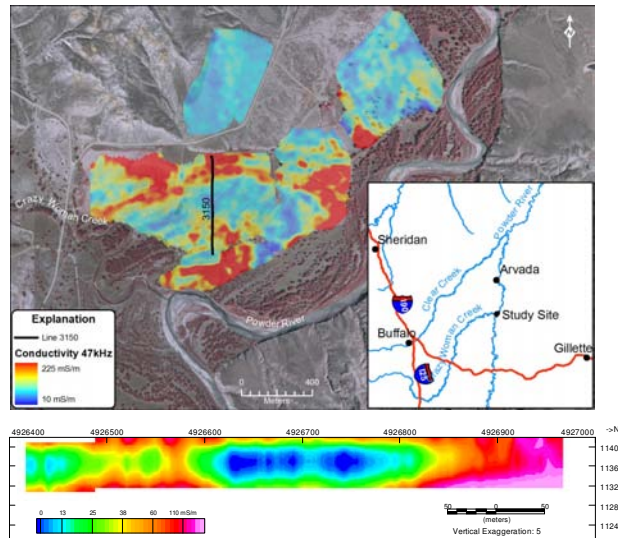
## Environmental Impacts of Oil and Gas E&P

- **Produced water management efforts are a subset of the DOE HQ strategic O&G Water Initiative**
- **Evaluate Subsurface Drip Irrigation as a means of using CBNG produced water**
  - Long-term effect on soil productivity
  - Accumulation or mobilization of salts
  - Effect on native groundwater
  - Discharge to Powder River
  - Collaborating with Anadarko Petroleum at Headgate SDI Site - Operated by Beneterra, Inc.
- **Conduct a long-term, science-based assessment**
  - Electromagnetic surveys useful for SDI design
  - Monthly geophysical surveys to trace movement of SDI water
  - Monthly sampling of vadose and phreatic zone
  - Continuous monitoring of groundwater temperature, conductivity, and water table elevation



Electromagnetic surveys

## Electromagnetic Induction Survey

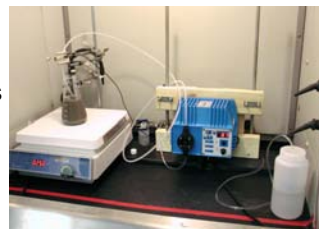


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## Environmental Impacts of Oil and Gas E&P

- **Develop methods for determining suitability of ephemeral stream courses for CBNG produced water**
  - Airborne electromagnetic, and spectral surveys of Beaver Creek watershed (WY)
  - Evaluate results of stirred batch leaching tests
  - Protocol for estimating amount of produced water that can be discharged before flooding/erosion occurs
- **Environmental assessment of next generation oil shale retort technologies (WVU)**
  - Determine O&G E&P impacts on stream ecology in Allegheny National Forest
  - Work with PA Dirt and Gravel Road Program to develop O&G road construction protocol
- **Minimize environmental footprint of E&P from Marcellus Shale gas play**
  - Apply methods used elsewhere to minimize environmental impact (multiple wells from single pad, frac farms)



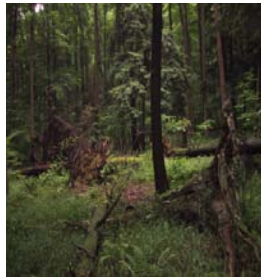
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## Environmental Impacts of Oil and Gas

- **Effects of oil and gas E&P on air**
  - Assess air quality based on measured data and modeling results for regulatory and permitting applications
  - Source-receptor/pollutant transport models
- **Challenges**
  - Estimates of air quality impacts of oil and gas production are generally based on models that treat all development in a state as a single point source
  - Emissions from oil and gas production activities vary by type of activity and there are a wide range of pollutants



- Allegheny National Forest
- 512,998 acre forest in northwestern PA
- 8,000 wells in 2005; currently 12,000
- Western site - TBD

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## Air Quality Model Selection

Source-Receptor Model:  
Positive Matrix Factorization  
(PMF)

$$x_{ij} = \sum_{h=1}^p g_{ih} f_{hj} + e_{ij}$$

$x$  = data matrix of  $i$  species and  $j$  days

$g$  = compositions for  $h$  sources

$f$  = contributions of  $h$  sources

$e$  = error matrix

$p$  = number of sources

Pollutant Transport Model: The  
Comprehensive Air quality  
Model with Extensions (CAMx)

- Eulerian photochemical dispersion model
- Gaseous and particulate air pollutants (ozone,  $PM_{2.5}$ ,  $PM_{10}$ , air toxics, etc.)
- Uses any meteorological model in combination with any emissions processor



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## Environmental Impacts of O&G – FY09 Plans

- **SDI - Complete 2 semi-annual well samplings and geophysical surveys**
- **Establish Eastern air quality monitoring station**
- **Prepare report on environmental impact of emerging oil shale technologies**
- **Proof of concept flights completed for drones**
- **Summarize findings from 1<sup>st</sup> year of monthly macroinvertebrate sampling at impacted and non-impacted streams**

## Enhanced and Unconventional Oil Recovery

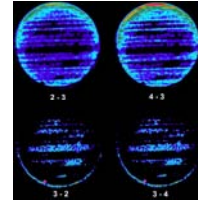
- **Technical challenges**
  - Difficulty in characterizing fracture properties (e.g., orientations, lengths, apertures) that control flow
  - Two-phase transport properties of fractures themselves are not well-understood
  - As pressures in a reservoir change, fractures may open and close; this behavior is complex
  - Using an injectant in a fractured reservoir may be problematic because of the propensity for fast paths to be established; an understanding of the interaction between fluids in fractures and matrix rock should help the design of better recovery schemes



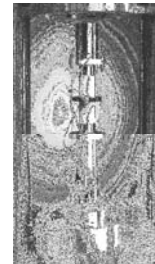
**Microscopic Image of  
Fracture Surface**

## EUOR Simulations Methodology

- Build on background research on fractured reservoir flow
- Integrate information from laboratory, field work, and simulations
- Collect information from geologic logs and other collected info to build model of Bakken
- Make measurements of shale properties (geomechanical and flow)
- Simultaneously develop technique to use neural nets to describe fractured reservoirs
  - FRACGEN/NFFLOW



CT Scanner used to characterize fractures and track fluid flow



Reservoir Rock Core Flow Unit

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## FRACGEN/NFFLOW

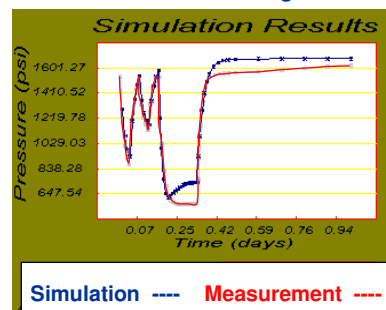
### •FRACGEN uses field data to characterize statistics of fracture networks

- Well log
  - Fracture orientation, aperture, and density statistics
- Outcrops
  - Clustering and fracture length statistics

Well test data from gas field

### •NFFLOW is a flow simulator for highly fractured reservoirs

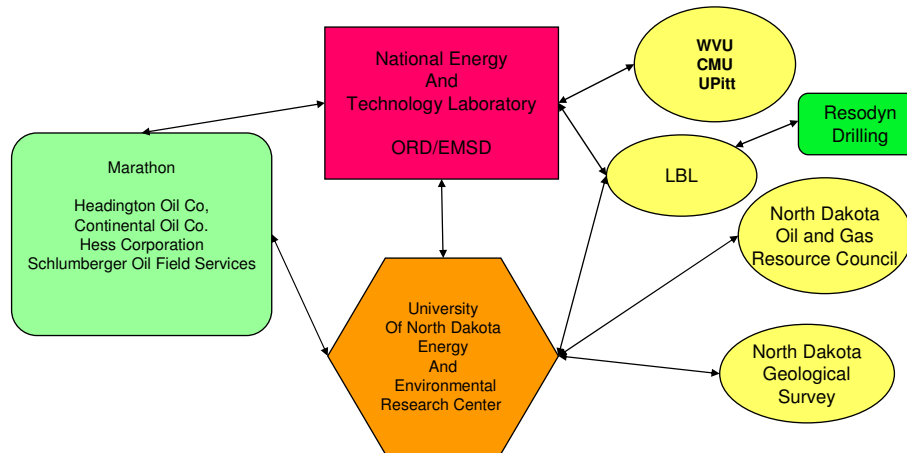
- Explicitly treats fracture networks with < 50,000 fractures
- Couples fracture flow with recharge from surrounding rock
- Handles gas or liquid



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## Bakken Shale Team



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## Enhancing Oil Mobility

- **Strategies for employing novel surfactants**
  - Design CO<sub>2</sub>-soluble surfactants that form foams or viscosity-enhancing micelles
  - Design water-soluble surfactants that form high CO<sub>2</sub> volume microemulsions
- **FY09 effort focuses on surfactants that increase CO<sub>2</sub> viscosity (Pitt)**
  - Promote formation of helical micelles that induce large increases in viscosity

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## EUOR FY09 Plans

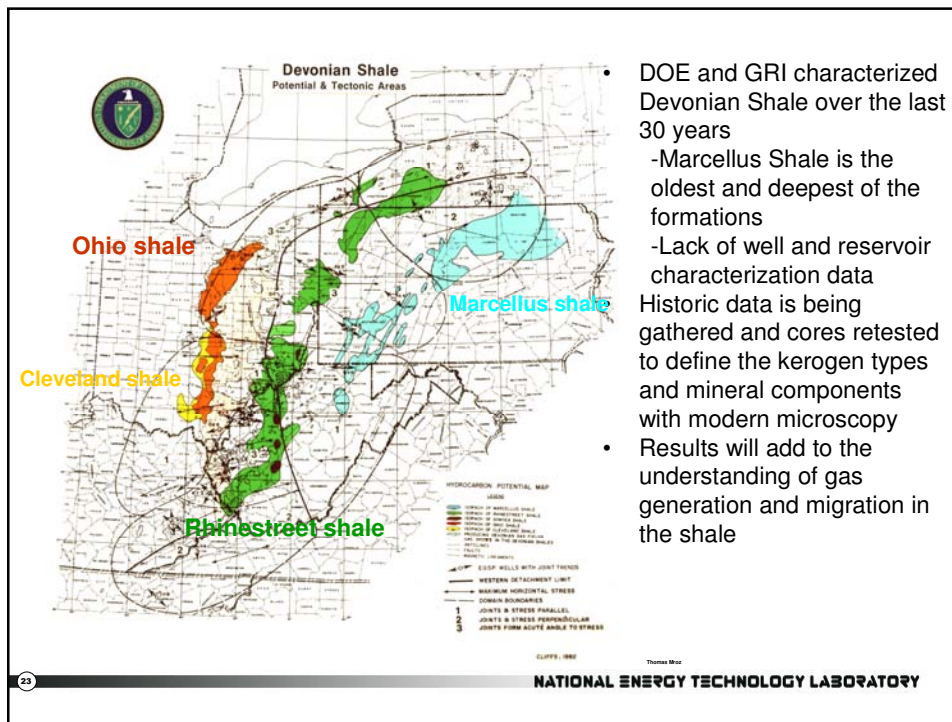
- **Perform tests for transport properties on Bakken shale cores**
- **Conduct initial reservoir simulation for a fractured reservoir with available field data**
- **Measure viscosity of CO<sub>2</sub>-surfactant solution using the falling cylinder apparatus**
- **Complete design package and preliminary cost estimate for proof-of-concept test unit for CO<sub>2</sub>-enhanced in situ oil shale conversion**

## Resource Assessment

- **Create a database of oil shale and tar sand documents for future use**
  - 18000 reports on microfiche
- **Resource characterization of the potential gas-in-place in Marcellus Shale (PSU/WVU)**
  - Initiated core, well log and geological data acquisition to characterize the shale formation
  - Characterization instrumentation is being upgraded
  - Collect info from previous studies on Devonian shale formation above Marcellus
  - Database being developed



Marcellus shale

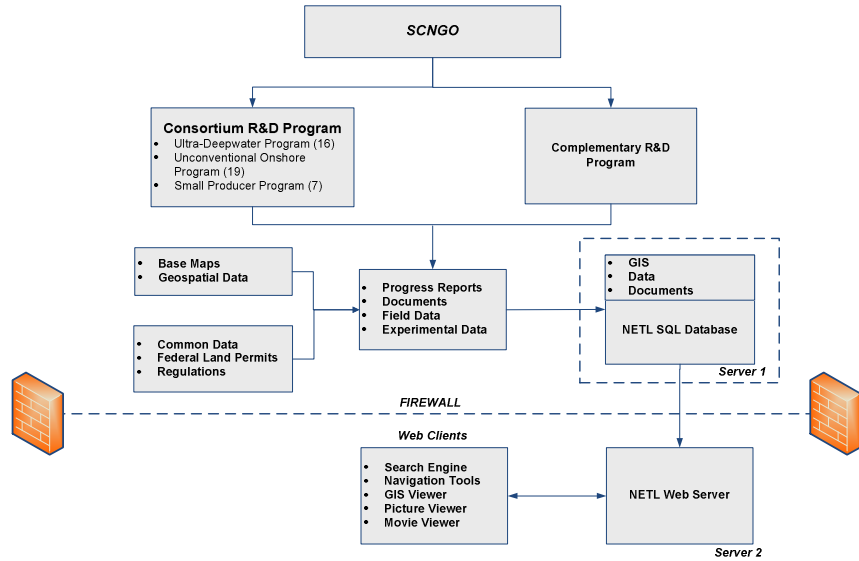


- DOE and GRI characterized Devonian Shale over the last 30 years
  - Marcellus Shale is the oldest and deepest of the formations
  - Lack of well and reservoir characterization data
- Historic data is being gathered and cores retested to define the kerogen types and mineral components with modern microscopy
- Results will add to the understanding of gas generation and migration in the shale

## Resource Assessment Planned Procurements

- **Microscopy enhancements including digital imaging software**
  - Acoustic microscope for shale porosity, permeability, and kerogen content
  - Digital upgrade of Etec SEM
  - Binocular high resolution UV microscope for analysis of cores and cuttings
  - Petrographic scope

## KMD Concept



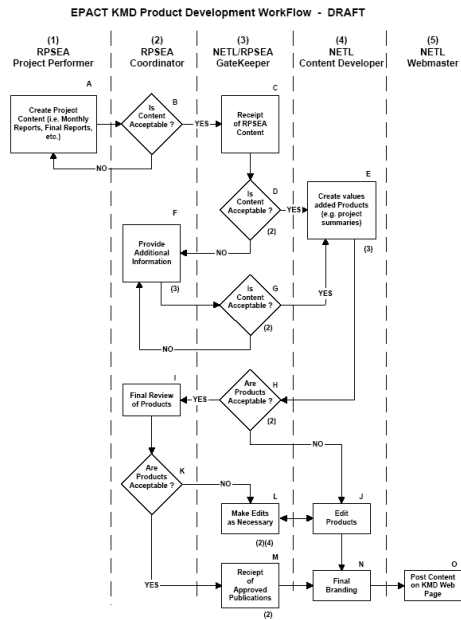
## EPAct KMD Workflow Diagram

- Web site portal within NETL web site

- To provide a single location of the results and products of the Section 999 Program
- Interactive problem solving features
  - Produced Water Management Information System (PWMIS)
  - Self-Teaching Expert System (SETES) for gas production of fractured shale

- FY09 will develop a work flow system with Consortium

- Includes reports, data, project status




## **Resource Assessment FY09 Plans**

- **Integrate the NETL oil shale and tar sand database and create links to other databases**
- **Prepare an annual report on gas and oil resource assessment for the Appalachian Basin**
- **Prepare a technical report on the integration of the Marcellus shale characterization task and updated database**
- **Complete a working version of the KMD**



## **Attachment 14**



## Unconventional Resources Technology Advisory Committee

September 11-12, 2008

Natenna Dobson  
Office of Oil and Natural Gas  
*Section 999 Team*

### Sec. 999: Supporting the Subcommittees

#### As Subcommittee Coordinator, I will:

- Most of all, just **Coordinate** the work of the committee members.
  - *I do not **DO** the work for members.*
- Assist the Subcommittee leaders when needed while allowing the subcommittee to maintain ownership of the work
  - Coordinate emails, assist in the setup of teleconferences/meetings, etc.
- Serve as liaison between the DOE/FE, RPSEA and subcommittee chairs
- Ensure the work of the subcommittee is being accomplished to meet the goals of the committee
- Ensure standardize procedures are met for establishing/maintaining a subcommittee

## **Sec. 999: Supporting the Subcommittees**

- Ensure the subcommittee are following the terms of reference outlined by the members for this committee work
- Assist in conflict resolution between subcommittee members should there not be enough resources to do the work, DOE/FE will actively try to address issues as they arise.
- When appropriate, attend local subcommittee meetings/teleconferences to increase the connection between DOE/FE to the subcommittee
- Ensuring open and timely communications with other Subcommittees
- Report to DOE/FE of Subcommittee activities and requests

**Questions?**

## **Attachment 15**

### **Subcommittee Presentations**

#### **Executive Summary (Policy)**

##### **Over-Arching Concerns**

- Lack of credible information on the Hill on the state of the industry
  - Benefit of multi-department study on the industry (DOE, Interior, Commerce)
  - Assemble all existing information and impediments to the industry
  - Tendency to dismiss outside information is discounted as biased (such as National Petroleum Council study)
- Federal input into state regulatory process
  - An example: greenhouse gas regulations could curtail oil and gas production
  - Federal government needs to be aware of the processes and participate in discussions of national security needs of oil and gas continued production
- Incentives
  - Small producers (significant users of technology); tax incentives in the early stages of technology application
  - Downside of existing incentives

*No-go areas overlaid with resources*

*Question—should this be in Executive Summary or Environmental?*

*Needs more discussion:*

*Regulatory impediments to oil and gas operations*

*Address technology-to-market barriers/issue*

##### **Committee Summaries**

- Research Focus
- Technology Transfer
- Environment
- Process

## **Process Subcommittee**

1. Evaluate funded projects for early successes that can be rolled out to the industry as soon as possible, even prior to completion of the research
2. Encourage researchers to become knowledgeable of prior or ongoing research at the NETL, other labs, universities, and other industries that may be leveraged into their projects
3. Research to evaluate technologies developed in other industries for use in the energy industries (e.g., medical nuclear magnetic resonance (NMR) technology, nano-technology)

## **Research Focus Subcommittee**

Six higher level core activities:

- Environmental
- Enhanced coal bed methane and CO<sub>2</sub>
- Oil shale and enhanced oil recovery
- Data analysis and uncertainty
- Geophysics
- Stimulation

## **Technology Transfer Subcommittee**

- Positive statement on progress to date
- Comment on transfer to small producers  
Formalize and develop a communication plan  
Supply chain improvement  
Organize by basin – pay particular attention to taxonomy to address this
- Comment on linking database to others – SP, Unconventional, Ultra-Deepwater, etc.  
Focus on quick results – management of information to industry  
Expectations
- New technologies. Webinars/CB – leverage organizations & conferences
- Comment on Time for metrics
- Comment on spend – leverage other funds centralize efforts.

## **Environment Subcommittee**

- 1) Regulatory best practices
- 2) Environmental impact analysis and mitigation — incl. “no-go” area

## **Attachment 16**

# Unconventional Resources Technology Advisory Committee Meeting

Sign-In Sheet - September 11-12, 2008

Last Name	First Name	Organization	Sign
Anderson	A. Scott	Environmental Defense Fund	<i>A. Scott</i>
Brown*	Nancy J.	Lawrence Berkeley National Laboratory	<i>Nancy J. Brown</i>
Cavens	Jessica J.	EnCana Oil & Gas (USA)	<i>Jessica J. Cavens</i>
Cline*	Jeffrey T.	Cline Energy Consulting	<i>Jeffrey T. Cline</i>
Daugherty	William S.	NGAS Resources, Inc.	<i>William S. Daugherty</i>
Dwyer	James P.	Baker Hughes	<i>James P. Dwyer</i>
Falkner	Julliette A.	The Nature Conservancy	<i>Julliette A. Falkner</i>
Hall	Jeffrey D.	Devon Energy Corporation	<i>Jeffrey D. Hall</i>
Hall	J. Chris	Drilling Production Co.	<i>J. Chris Hall</i>
Hardage*	Bob	University of Texas at Austin	<i>Bob Hardage</i>
Julander	Fred C.	Julander Energy Company	<i>Fred C. Julander</i>
Levey*	Raymond A.	University of Utah	<i>Raymond A. Levey</i>
Mark	Sandra D.	Black Hills Exploration and Production	<i>Sandra D. Mark</i>
Mohaghegh*	Shahab D.	West Virginia University	<i>Shahab D. Mohaghegh</i>
Sparks	Don L.	Discovery Operating, Inc.	<i>Don L. Sparks</i>
Tew	Berry H. "Nick"	State Oil and Gas Board of Alabama	<i>Berry H. Tew</i>
Weiss	Janet	BP America, Inc.	<i>Janet Weiss</i>
Zinke	Sally G.	Ultra Petroleum	<i>Sally G. Zinke</i>
			UNABLE TO ATTEND

\* Special Government Employee



***Unconventional Resources Technology Advisory Committee Meeting  
September 11-12, 2008***

**Staff Roster**

**U.S. Department of Energy – Office of Oil and Natural Gas**

CDN Guido DeHoratiis Acting Deputy Assistant Secretary	Acting Designated Federal Officer
Elena Melchert	Committee Manager
Natenna Dobson	Office of Oil & Natural Gas, Section 999 Team
Trudy Transtrum	Communications Coordinator, Office of Oil & Natural Gas

**National Energy Technology Laboratory**

John R. Duda	Director, Strategic Center for Natural Gas & Oil
Al Yost	Ultra-Deepwater & Unconventional Natural Gas and other Petroleum Resources Technology Manager (Acting)
Gary Covatch	Strategic Center for Natural Gas & Oil
Phil Dipietro	Office of Systems Analysis & Planning
David Wildman	Office of Research & Development

**Technology & Management Services, Inc.**

Mauri Lappinen	Committee Recorder
Karl Lang	Facilitator Support
Rob Matey	Committee General Support
Dominique Wells	Committee Registration Support